



FRIDAY, JANUARY 14, 1881.

Contributions.

The Control of Reading.

PHILADELPHIA, Jan. 12, 1881.

TO THE EDITOR OF THE RAILROAD GAZETTE:

The petition of McCalmont Brothers & Co., owning \$8,799,200 of stock and over \$6,000,000 of bonds in the Philadelphia & Reading Company, against the deferred bond scheme, makes clear a great many things that have been somewhat clouded in mystery since the suspension of the company on the 21st of May last. It will be remembered that the first step after the suspension of the two companies—the Railroad and the Coal & Iron Company, the Siamese twins who suffered together—Edwin M. Lewis, President of the Farmers' and Mechanics' National Bank of this city and trustee of the ten-million income mortgage; Stephen A. Caldwell, President of the Fidelity Trust, Insurance & Safe Deposit Company, which is the trustee both of the consolidated and the general mortgage, and President Gowen himself were appointed receivers on the petition of Moses Taylor, one of the general mortgage bondholders. It was a friendly suit, and Mr. Taylor applied in the interest of President Gowen, who practically named the receivers himself, Mr. Lewis having been trustee for many of the loans contracted by the two companies, and Mr. Gowen's fiscal agent for borrowing money. The Court authorized the issue of receivers' certificates to the amount of a million at once, with which to meet first and second-mortgage interest, and later to the amount of more than a million more, with which to pay current accounts for supplies and materials furnished the two companies. None of these have been paid as yet, and there are now outstanding more than two millions and a quarter—exactly \$2,279,495. In addition to this there was about three-quarters of a million unpaid coupons and interest.

The receivers went about their work slowly, so it seemed to the impatient creditors—but there was so much to do that it is not at all surprising that almost three months elapsed before they were able to report just what the company owed for interest and for what it was further bound in the way of guarantees. These results it is not necessary to state here, as this letter will have to do only with the proceedings looking to a change in the management which had controlled the destinies of the company for a decade, and had quadrupled its debt without increasing its earning capacity 50 per cent. On the 17th of June last President Gowen wrote to Mr. Joseph S. Harris to ask that he would make for the receivers of the company a full report "upon the condition, value, and capacity for production, and present and future earning power of the coal lands and colliery property of the Philadelphia & Reading Coal & Iron Company." That report, it may be interjected here, was submitted about two months afterwards, or about the middle of August, but it was not made public until the 6th of December, because Mr. Harris, who is admitted to be without a superior as a careful, conservative and experienced mining engineer, reported the lands owned by the company and controlled by it through ownership of stock as worth only \$32,394,799, while President Gowen claimed them to be worth \$75,600,000—slight difference.

Meanwhile President Gowen was in correspondence with McCalmont Brothers & Co., and he wrote them on July 2, saying, "Now that disaster has come, I can see how in this as in other matters I have been blind, but I never looked on any side but success, and I deceived myself more than any one else. I am now and always ready to withdraw from the receivership in favor of any one who will give greater confidence to the owners. Above all, however, I should like at all times to do or say anything that may be necessary to relieve you from the unjust accusation of being in any manner responsible for any of the calamity which has overtaken the company." Here is a direct offer to resign and an acquittal of the Messrs. McCalmont from any share of blame for the failure. On the 18th of the same month Mr. Gowen again addressed Messrs. McCalmont & Co., saying that reorganization cannot best be brought about by foreclosure, as that would separate the two companies and sacrifice many valuable franchises. On the other hand, by means of a receivership to continue for—say five years—he thought the floating debt might be gradually wiped out, and all obligations after the income mortgage turned into a preference dependent on earnings for income, the general-mortgage bondholders to accept 4 per cent. per annum for five years. In the meanwhile they could turn their attention to securing as far as possible a reduction of rentals of the canals and some leased lines, and of the guarantees, or their conversion into preferred or common stock. Mr. Gowen goes on to say that he has written this private note before addressing the London bondholders' committee, then organized with Lord Cairns at its head, and "if the above plan is adopted I have no desire to remain as receiver unless the great majority of those interested in the company desire me to remain." Further on in the letter he says: "I must not be put in the position of forcing myself into the receivership against the wishes of those who are entitled to have a voice in the approval or selection of the receivers." Four days later, on

the 20th, President Gowen wrote again, explaining his scheme still further and suggesting speed, so that arrangements might be made in the time of low earnings, when everyone was in a favorable mood for a compromise. On the 30th the foreign bondholders' committee passed resolutions in substance identical with the ideas expressed in President Gowen's letters, and suggesting the appointment of an American committee to co-operate with the receivers. These resolutions were communicated to President Gowen in a letter from the committee dated Aug. 7, in which they say that his letters to McCalmont Brothers & Co. have both been laid before them, that they concur with his views, and that they hope before long to send some qualified agent to confer with the receivers and an American committee, if formed. They add that with reference to his proposed suggestion, though they think their determination ought to be reached as soon as possible, yet they would prefer to wait until the return and report of their agent. Subsequent events, must, however, have determined them upon quick action, for, on the 26th, in the letter notifying Mr. Gowen that they have selected Mr. Powell as their agent, one of the committee, they also say that in their report about to be issued to the bondholders, they would be unable to recommend a continuance of the receivership, unless they could at the same time state "that the receivership will for the future be in hands entirely disconnected with the management and policy of the company before its failure." For this reason, "they must now ask you, in accordance with your offers already made, to allow them to state in their report that your resignation will take place as soon as arrangements have been made for the appointment of your successor."

From this time all friendship seems to have been at an end. Mr. Gowen was asked to cable his reply, which he did on the 8th of September, asking that all action be deferred until the receipt of a letter mailed by next steamship. The committee replied on the following day that delay would hamper them, and asked him to cable the substance of his letter. He did so on the 10th, saying that his offer of withdrawal was based on the adoption of his plan for the reorganization, and that he could not resign until such a result was definitely accomplished—which was as much as saying that he intended to stick as long as there was any necessity for receiver. On the 17th, a week later, the committee cabled him, promising to wait, but, at the same time, telling him they considered his offer to withdraw an unconditional one. On the 24th a cable dispatch was sent over the signature of Lord Cairns, Thomas Wilde Powell and Hugh McCalmont, asking him to abstain from communicating his plan to any one until Powell's arrival, and saying that the American committee suggested by him had too much of the element of former management to work effectively, or have the confidence of the London committee. This committee, to which objection was made, was constituted by President Gowen so that four out of the six members of the present board of managers would be in a majority, with Moses Taylor, of New York; President Hinckley, of the Philadelphia, Wilmington & Baltimore, and President Garrett, of the Baltimore & Ohio, as the other members. Considering that the London committee wanted the receivership disconnected with the former management, it was hardly to be expected that they would consent to the board of managers having a majority in the committee to be formed. President Gowen replied by cable that he wanted a committee to represent all interests and that any attempt to ignore or slight the former management and their friends, who own a large proportion of the open indebtedness would result disastrously to any plan that might be proposed. In reply to this the committee cabled him on the 29th, indorsing the previous dispatch of Cairns, Powell and McCalmont, and repeating, "Old management may be represented, but must not preponderate." The week before they had received a long letter from President Gowen dated on the 10th. This was the letter in reply to their request for his resignation, and he says in effect that he must look out for the holders of the open indebtedness and that he cannot give up the place in which he was placed by the Court until some provision is made for their relief; they looked to him and they should not look in vain. To this the committee replied on Sept. 30, saying that they regretted the conclusion to which he had arrived, and disagree entirely with his claim of a right to dictate a policy for terms of arrangement among the various interests. Here ends the correspondence with the London committee, and three days later Mr. Thomas Wilde Powell sailed for America as the accredited agent of the London bondholders' committee.

Eighteen days afterwards, on the 20th of October, he was at the office of the company in conference with the board of managers regarding the formation of an American committee. After he left, the board met and voted to act as part of the committee, and suggested the gentlemen named above as Mr. Gowen's selection, together with Presidents Conegys, of the Philadelphia; National Bank; Smyth, of the Pennsylvania Company for Insurance on Lives; and Smith, of the National Bank of North America. To this Mr. Powell replied from the office of Mr. John C. Bullitt, regretting that the support which he had received from some members of the board as to the composition of the committee had been overruled by the views of President Gowen. He wanted groups of representatives of each of the several interests concerned, with some strong names to give it prestige. While President Gowen wanted the board to act with some other gentlemen who did not necessarily represent any special interests, Mr. Powell objected to the presence of the entire board in the committee, and regretted to find that the delay in the formation of an American com-

mittee had been due to President Gowen's objections. The board replied, urging the necessity of Mr. Gowen's being a member of any committee, and asking Mr. Powell to make any suggestion regarding a plan of reorganization which seemed proper to him. Mr. Powell promptly returned to the assault on the next day in a letter in which he contended for a Philadelphia committee—not a committee of which the board should be the substance—and declining to be led off into a side issue by considering the appointment of such a committee as had not been suggested by the London committee or himself. Six days elapsed, owing to the absence of some of the managers, before their action was communicated to Mr. Powell. They, in conjunction with the receivers, had unanimously agreed upon a committee of ten, of which four were also members of the board of managers. Mr. Powell replied saying that he would have preferred a committee more definitely selected by the different classes in interest, but still he would meet them. A week later, on the 11th of November, he was notified of a meeting at noon on that day. On the very same day that the board chose this committee, the 3d of November, Mr. Powell wrote to President Gowen, telling him that the Messrs. McCalmonts "absolutely refused to support the deferred bond scheme," and asked him to discuss with President Gowen some practical scheme of adjustment. To this President Gowen replied, saying that he would be glad to see him, but that all the conditions precedent to the issue of deferred bonds had been complied with, and that the issue would be made as soon as the papers could be signed. Mr. Powell answered, that of course it was now too late to discuss any other plan, and he would therefore wait for the meeting of the American committee. On the 6th President Gowen wrote that the American committee would be called together as soon as it was convenient for them to assemble. On the 9th Mr. Powell wrote to inquire if President Gowen would not be kind enough to let the members of the committee know that he was awaiting their pleasure, and try and get them together as soon as possible. President Gowen then notified them that they would meet on the 11th, and informed him that "I differ entirely with you on the propriety or politeness of your expressed determination to ignore the officers of the company."

Two more letters close the correspondence—the first written by Mr. Powell after the adjournment of the American committee on the 11th to await the result of the deferred bond scheme, and which the Messrs. McCalmonts absolutely refused to have anything to do with, and the reply of President Gowen, dated on the following day. Mr. Powell asked whether or not it was true that Messrs. McKeon and Borie, being part owners in coal lands, had sold them to the railroad company while they were directors. And if that was the case, whether President Gowen knew it in 1877 or not. To this Mr. Gowen replied personally—not as President—acknowledging the truth of the fact that they were interested as owners of a sixth of the lands in question, and then defending the purchase. The letter concludes with a most remarkable assault upon Mr. Powell, in which Mr. Gowen says "that you are entirely incompetent to form any correct judgment upon such a question as the value of coal lands; that your real position as a confidential agent of the Pennsylvania Railroad Company makes it highly indelicate and improper for you to attempt to inject yourself into the affairs of the Philadelphia & Reading Railroad Company; that your statement that you have but recently learned about the transactions connected with the purchase of the Tamaqua lands is infamously false; any other communication received by me from you will be returned unopened."

The day after Mr. Powell received this he stepped up to the hotel counter and paid his bill, leaving a city direction for this letters. The clerk politely asked in which direction he was going. "Only for a run into the country for a few days," replied the canny Scotchman.

A fortnight later he was in London. R. W. M.

The Diameter of Locomotive Boiler Tubes.

TO THE EDITOR OF THE RAILROAD GAZETTE:

Your editorial on "Passenger Locomotives" in the number for Dec. 31, I have read with a good deal of interest. I notice, however, that your conclusion in regard to tubes, viz., that they should be increased in diameter, is quite different from that of Mr. Robert Wilson, as given in his "Treatise on Steam Boilers," pp. 288, 289 and 290. Mr. Wilson, starting out with certain considerations of evaporative efficiency, and the fact that the cross-section of tubes increases with the square of the diameter, while the surface increases only with the diameter, comes to the conclusion that the diameters should not be increased unless the length can also be increased. Of course, if the tube receives four times as much of the heated gases as did one of half the diameter, its capacity to give this heat up should be greater than that of the smaller one. Mr. Wilson would attain this object by doubling the length of the tube. This, in locomotives, is of course impracticable, and Mr. Wilson concludes that a decrease of diameter would probably be advisable. In England, where locomotive engineering is in a much more advanced state than in this country, the tubes are generally $1\frac{1}{4}$ in. diameter.

One paragraph of Mr. Wilson's is worth quoting. It is as follows:

"When a fuel is used which burns with a long flame, the diameter of the tubes should not be too small to exclude the flame altogether from passing along them, as it is of much more evaporative value than the transparent products of combustion, owing to the small radiating effect of the latter. But where the hydro-carbons and carbonic oxide can be sufficiently burnt before reaching the tubes, these

can scarcely be made too small. In locomotive furnaces, the presence of the brick or water arch, by retarding the passage of the gases to the tubes and giving more time for the proper combustion of the volatile parts of the fuel, should render successful the application of still smaller tubes than are generally used." F. W. DEAN.

CAMBRIDGE, Mass., Jan. 11, 1881.

[The reason for increasing the diameter of the tubes, in the case referred to, was to give an aggregate larger sectional area, in a boiler of limited size, for the passage of the smoke or products of combustion from the fire-box. It is not clear how this could be accomplished by diminishing their diameter.—EDITOR RAILROAD GAZETTE.]

The Best Position for the Centre of Gravity of Locomotives.

[Student's Thesis at the Lehigh University, June, 1880.]

So much attention has recently been given to the adaptation of locomotives to high rates of speed, that any discussion of the subject in relation to their stability, which may tend to set aside mistaken theories or confirm new ones, must to some extent be attended with good results.

In selecting the subject for this thesis, it was with a consciousness that the views expressed will subject it to the criticism of those who maintain the very generally accepted theory that not only economy of maintenance, but stability of movement, and even safety itself, depend upon such a construction of the locomotive that its centre of gravity may be as low as is possible to place it, having due regard to sufficient space for such of the mechanism of the valve motion as is usually placed beneath the boiler.

Much hesitation is therefore felt in attacking the principle of so widely extended and almost exclusive practice; nevertheless it is hoped that in the light of the argument here offered, the attention of those interested may be awakened to the subject, for there seems to be a wide field for improvement, especially with reference to machines which are required to move at the higher rates of speed upon lines having considerable curvature.

During recent investigation of the subject, frequent opportunities for observation and experiment have been made available, the result of which has shown that the position of the centre of gravity, especially upon the vertical line, is of much importance, as well in contributing to steadiness of movement when passing around curves as in modifying the effect of shocks due to inequalities of the rail surface, and although the subject has been casually referred to by writers upon locomotive construction, no attempt to elucidate the principle involved has been made.

In Mr. D. Kinneir Clark's standard "Treatise on the Mechanical Engineering of Railways," page 176, reference is made to the subject when describing the Crampton engine, as follows:

"The centre of gravity of the machine is placed very low; and this is a condition on which much stress has been laid, and to which much of the stability of the engine is attributed."

Further reference is made to the subject on pages 187 and 193, where he says:

"Though it is proper to keep down the mass of the machine, so far as convenient, the height of the centre of gravity is practically a matter of minor importance. We have found high-pitched engines to run very steadily, showing no particular susceptibility to roll, even with inside bearings only; so much depends for stability on other and entirely different conditions. Indentations of the boiler to clear the axles and machinery, or the removal of the driving-axle altogether to the rear, with the object of lowering the boiler, are expedients which we regard with indifference, and they can only be viewed as imperfect remedies for what may otherwise be efficiently prevented. It is supposed, indeed, that the centre of gravity ought to be in or as near as possible to the level of the line of traction, or of the draw-bars. But there is very little relation between them: * * * the centre of gravity may be high or low, within practical limits; the driving-wheels may be placed anywhere, and the loads on the axles may be proportioned at pleasure, reserving a small proportion for necessary leading weight."

These negative, if not seemingly contradictory, references to the subject lead to the conclusion that the question of the specific effect of the position of the centre of gravity on the vertical line had not been so closely investigated as it deserved, although some attention had been given to the influence of the position on the horizontal line.

The subject is also referred to in "American Locomotive Engineering," edited by Mr. G. Weissenborn, M. E., page 210, as follows:

"By placing the centre of gravity too high, the engine could not run steadily, from having too much side motion, which would be a great objection to a high speed express engine."

It is to be supposed that the expression "too high," as used by Mr. Weissenborn, refers to any unusual departure from the ordinary limits of construction observed by American builders; but it would have added much to his interesting work could he have given a statement of actual investigation of the subject, founded upon experimental tests.

Several instances of a very considerable departure from the usual practice with reference to the position of the centre of gravity having recently occurred, the opportunity for comparison has been thus afforded, and the following observations recorded:

Two locomotives, having a capacity for drawing a passenger train on a level, or nearly level grade, at a speed of about sixty miles per hour, were chosen for observation. The essential difference in their construction was in the relative position of their centres of gravity upon the vertical line. For, while this point in one—so far as the whole mass was concerned—was about $17\frac{1}{2}$ in. higher than the other, yet by reason of the greater elevation of the boiler above the frame, the centre of gravity of so much of the machine as rested upon the bearing springs, was nearly two

feet higher than the other. And, as the weight of the boiler and frame, with their appendages, may be taken as about three-fourths of that of the entire locomotive, it can not be doubted that the influence of its position upon the stability of the engine while in motion must be very apparent.

The other engine was of the usual type, the boiler being placed as low as the arrangement of wheels and working parts would permit.

In order to more clearly show the contrast in height of

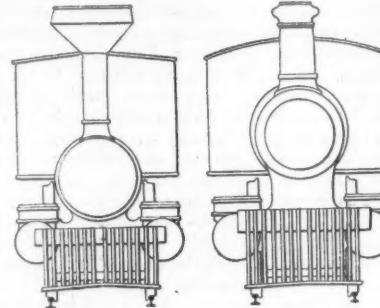


FIG. 1.

FIG. 2.

the two engines referred to, the accompanying diagrams (figs. 1 and 2) are presented.

For the purpose of facilitating proper observation of movement, an apparatus was devised, a sketch of which (fig. 3) is shown, and which may thus be described. A lever, A, having its fulcrum so placed as to multiply the motion of its shorter arm twice, was secured to the frame of the engine as repre-

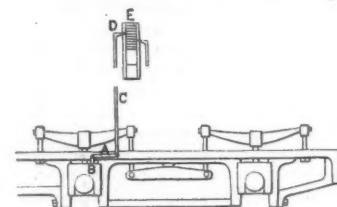


FIG. 3.

sented. At the end of the shorter arm of the lever, a jointed rod was attached, the lower end of which rested upon the main driving axle-box at B; at the end of the longer arm of the lever a vertical rod, C, jointed at its lower end, was attached. To the upper end of this rod was attached an index, D, by means of which, in connection with the grad-

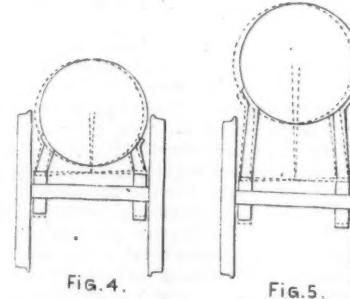


FIG. 4.

FIG. 5.

uated plate, E, the vertical movement of the driving-axle box and the play of the spring might be noted.

A similar appliance was attached to the opposite side of the engine over the same axle, so that comparison might be made of the disturbances taking place on both sides of the machine at the same time.

As the springs were each capable of sustaining 2,100 lbs.

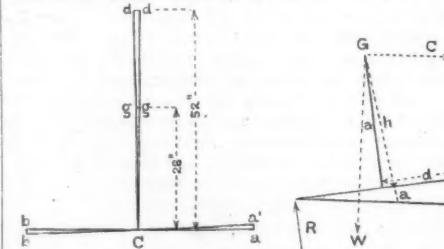


FIG. 6.

FIG. 7.

for each half-inch of depression, an observation of the indicator when rounding curves showed to what extent the super-elevation of the outer rail compensated for centrifugal force, and what relation the respective positions of the centres of gravity of the two engines bore to their stability and the smooth passage of curves; it also afforded means for observation, with reasonable precision, of the extent of the rolling motion of the body of the machine, as well as to determine the strains to which the springs might be subjected by reason of an uneven surface of track. In order that the rolling motion of the body of the machine as distinguished from that of the whole mass may be clearly understood, figs. 4 and 5 have been prepared, the dotted lines in which will serve to show the imaginary lever arms and the points of support of the springs upon the driving boxes of both engines, and from the relations of these arms it may be demonstrated

that with a given depression of the spring on either side, as shown upon the index plate, a corresponding reaction of the body of the machine takes place.

As the experiments referred to were chiefly made about the close of the winter, a season when the track surface is generally in worse condition than at any other time of the year, the opportunity for comparison was particularly favorable.

The table appended will serve to show some of the results determined, No. 1 indicating engine having high centre of gravity and No. 2 the low.

Speed per hour, miles.	Degree of Curvature.	Super-elevation of outer rail.	Max. depression (+) or expansion (-) of outer spring.	
			No. 1.	No. 2.
30.	4° 15'	0°	.25"	.187"
35.	3°	2.0°	.031"	.015"
40.	1°	2.1°	-.002"	-.031"
50.	2°	2.3°	.003"	.031"
60.	2°	3.0°	.156"	.062"

On tangents the maximum depression of the springs of No. 1 was shown to be three-fourths of an inch, while in No. 2 it did not exceed one-half inch, these depressions being attended with jolting movement in No. 2, while No. 1, excepting a slight vibratory movement, was comparatively steady.

Reference to fig. 6 will explain the cause of the difference in stability of the two engines while moving upon a tangent line. This figure is a combination of figs. 4 and 5, both centres of gravity being shown in one line. The figure refers only to the mass supported by the springs. ab is an imaginary line joining the bearing points by the springs; cd is an imaginary vertical line containing the centres of gravity g and d, of the masses supported by the springs.

If it be supposed that a depression of the springs takes place indicated by aa, the low centre of gravity would move through the arc gg, the high one moving through the arc dd, and, approximately, gg : dd :: 28 : 52, showing a resistance to lateral movement, three and one-half times greater in the case of No. 1 than in that of No. 2.

It will be observed that the centre of gravity of the body of No. 1 is so far above the point of its spring supports that the greater inertia of the mass, acting through the long arm of the imaginary lever, will enable the springs on either side after depression to recover their normal position without to any great extent disturbing the stability of the mass above them. Or, in other words, before any considerable pendulous movement of the mass could take place, the springs had recovered from the shock, and but little disturbance of stability other than a slight rolling motion had taken place; while in the case of No. 2, the much lower centre of gravity rendered the inertia of the mass, acting through the shorter arm, incapable of performing a similar function, consequently any undulation of either rail surface was attended by a corresponding rise or fall of the machine, accompanied by shocks and jolts, which gave rise to the comparative instability of the engine and the rougher riding experienced.

It was when moving upon curves, however, that the most marked difference in the stability of the two machines was noted.

In the case of No. 2, the passage of curves was attended with more or less severe lateral shocks, resulting from crowding against the outer rail and falling away from it, producing at very high speeds a sensation as if the movement of the wheels was marked by a series of short tangents.

The reverse was, however, the case with No. 1; its stability upon curves being equal to that upon tangents, the indicator showing a notable steadiness, due to the transfer of more of the weight of the machine upon the outer rail than was the case with No. 2. Indeed, so very marked was the steadiness of the machine upon curves, even at the highest speeds, that it would have been difficult, if one were blindfolded, to determine with certainty whether curve or tangent was being passed over.

Although the investigation of the subject was directed chiefly to the position of the centre of gravity, with reference to the vertical line, yet the relation of that point in the longitudinal line is of perhaps equal importance. And, while dealing with the subject, it is with hesitation that exception is taken to the conclusions reached by so distinguished an authority as Mr. Clark, who, when referring to the Crampton engine, states as follows (page 176):

"The position of the driving-wheels in the rear is, we believe, the only tangible cause of the stability of these engines."

And on page 172: "In Crampton's engines the mass of matter in advance of the driving axle still further promotes their stability."

That the very long wheel-base of that type of engine prevents sinuous movement to some extent is beyond a doubt, but it seems equally certain that with a moderately short wheel-base such an engine would be in principle quite as unstable and erratic in its movement as would an arrow which had been discharged with its centre of gravity rearward; for the mass of the machine, having to be pushed by the tractive force at its rear, can not but be swayed to the right or left as accidental circumstances might influence it.

Were the direction of the motion of this machine reversed, the driving axle then being forward, the utmost steadiness as regards sinuous movement must result from dragging the mass instead of pushing it.

The position of the cylinders on the Crampton engine and the weight opposed to the oblique action of the connecting rod have, doubtless, much to do with its stability; but so far only as the position of the driving axle with reference to the centre of gravity is concerned, the weight of evidence is against the conclusion arrived at by Mr. Clark.

For the purpose of comparison with the results of observation, mathematical formulæ may here be deduced, first finding a formula for insistent weights upon the rails and investigating the effect of the height of the centre of gravity upon super-elevation of the outer rail, referring for this purpose to fig. 7, in which G is the centre of gravity, A the angle of the road-bed, W the weight, C the centrifugal force, R and R the insistent weights on the wheels. Whatever the super-elevation may be, C , W , R and R must be in equilibrium, and by using the moments and solving for R and R we find as follows:

$$(1). R = \frac{1}{2} [W(D \cos a + h \sin a) - C(h \cos a - D \sin a)]$$

$$(2). R = \frac{1}{2} [W(D \cos a - h \sin a) + C(h \cos a + D \sin a)]$$

in which h is the height of the centre of gravity upon a perpendicular to wheel base, and d is the semi-gauge.

If the super-elevation is the proper one, $C = W \tan a$. By substituting this in (1) and (2), it is found that $R = R = \frac{W}{2 \cos a}$.

Taking (1) and solving for h and substituting the values of R and C there results:

$$(3). h = \frac{D \cos a + D \tan a \sin a - D \cos a}{W \tan a \cos a - W \sin a} = \frac{D(\cos^2 a + \sin^2 a) - D}{(\sin a - \sin a) \cos a} = 0$$

h is therefore indeterminate, or in other words a change in height of the centre of gravity does not disturb the formula for determining super-elevation.

This, however, is based upon the condition that centrifugal force remains the same for all positions of the centre of gravity, although this is not strictly the case; for, since the axis of the engine is inclined inward, and centrifugal force depends upon the radius of the curve described by the centre of gravity, the intensity of this force will vary as the centre of gravity may be raised or lowered.

The value of the centrifugal force is:

$$(4). C = \frac{W V^2}{g r}$$

and if the centre of gravity is raised, r becomes equal to r' , which is less than r . The centrifugal force then becomes:

$$(5). C' = \frac{W(V')^2}{g r'} = \frac{W V^2}{g r} \times \frac{r'}{r}$$

The first part of (5) is equal to the value of c , the second part $\frac{r'}{r}$ is less than one; hence:

$$C' < C$$

So that when the centre of gravity is raised, the required super-elevation of outer rail becomes less for a given speed.

The conclusion which may reasonably be arrived at is: That upon a line over which a mixed traffic has to be passed, with its greatly varying rates of speed, and upon which the super-elevation of the outer rails of curves is averaged for extremes of speed, if the locomotives assigned to the express train service have their centres of gravity as high as is practicable to fix them, they will possess specific advantages as well in regard to their stability of movement as to their modified strains, and consequently reduced destructive action upon the track—qualities which can not but conduce to the most important results in connection with railroad economy.

F. C. WOOTTON.

LEHIGH UNIVERSITY, June, 1880.

Track Work for the Season.

TO THE EDITOR OF THE RAILROAD GAZETTE:

There are hundreds of thousands of dollars worth of labor and material thrown away every year on our railroad tracks in the course of construction and repairs. This arises from misapplication of the labor and carelessness or imprudent use of the material. To put it more plainly, there is a great deal of work done that is an injury rather than a benefit to the track, and a great deal of new material wasted or spoiled by improper use. This not only causes a leak in the company's treasury, but it subjects the officers and employés to a great deal of unnecessary trouble. The leak is larger during the winter months than at any other portion of the year for various reasons. In that portion of the year when the road-bed and ballast are not frozen, it is an easy matter to employ labor to good advantage, but when the track is frozen solid it requires more than an ordinary exercise of judgment to insure an economical disposition of labor.

It has before been pointed out in these columns that many of the winter accidents are the results of measures that were taken to prevent them, but as these accidents continue to be frequent it may not be out of place at this season to mention the matter afresh. More particular reference is had here to the breaking of rails; but there are other matters connected with winter track repairs that need attention. On roads with but little or no ballast there is much shimming to be done in winter; and although that operation is intended to preserve the rails as much as possible, it is frequently the cause of their breaking, by reason of the work being improperly done. It requires great care in shimming to give the rail a bearing on all the shims alike, and when the rails are frosty, bad shimming is liable to cause breakages. It is usual for the foreman to go ahead and get the rails into surface, when others follow up and put in shims where needed; and some of these workmen, without thought or experience, drive wedges, or shims, that are too thick under the rail, thus raising it from its bearings on either side of that particular tie, where the shim is too thick, and the rail has no bearing for several feet. This, when the road-bed is like a rock, is sure to cause mischief, and the foreman or some competent person should inspect every shim put in before leaving the work; not only to as-

certain whether the rail is properly supported or not, but in case of very thick shims to see that everything is spiked up so strong that the rails can resist lateral pressure and no accident result from spreading of rails. The winter thus far has been unusually severe, and present indications are that it will continue so, and more than ordinary care is necessary on the part of road-masters and section-men to prevent an unusually long list of disasters from broken rails. Where track is only moderately rough, it is better to let it remain so than to put it in good surface by bad shimming. Although a rail may be out of surface, it will have a bearing on all the ties, and would pass the winter without breaking, whereas if it was improperly "wedged up" to a surface the first train would be liable to break it. The rolling stock of the country is admirably adapted to uneven surfaces, but it does not run well on broken rails. Our fast roads, or most of them, are so well ballasted and put in good condition before cold weather that little or no shimming will be necessary during the winter, but we have some thousands of miles of roads that were frozen up in bad shape, and we may expect an unusual amount of trouble on these roads. In a large portion of the country the fall months were exceedingly wet, leaving the tracks in bad surface, and those that were in a tolerable condition on poor ballast will have badly on account of excessive moisture in the ballast when the cold weather sets in. Indeed, the month of December, just closed at this writing, has been fruitful of accidents from broken rails and frogs, and it is safe to say that no small share of them resulted from bad shimming. We yet have a long winter before us, and it will pay to give track repairs extra supervision, and have work done more with a view to prevent breakages than to reach perfection in surface, however much that may be desired. Many of the steel rails now in use must be humored a little, or allowed to have their own way, especially on frozen road-beds, and they must be skillfully treated where repairs are necessary to insure anything like safety. Ordinarily, a trackman cannot spend his time in winter to any better advantage than to be hunting around after broken rails and clearing the flange-ways at road crossings. The flanges between crossings can be thoroughly cleaned by using the track-cleaners in use on some roads—notably the Ogdensburg & Lake Champlain road, and other roads in that vicinity. A very cheap and efficient scraper—the invention of Mr. Abraham Klohs, Master Mechanic—is attached to the under side of a freight car, which is run through the winter as a "caboose" on a way freight. The car and scraper are in charge of a man thoroughly acquainted with the road, and in this way one man does the work that it formerly required hundreds to accomplish with pick and shovel. Moreover, the work is done to better advantage than when done by hand labor, for the reason that the flanges could not be shoveled out as often as necessary in stormy, drifting weather, and the snow became packed into hard ice before it could be removed, and required the use of the pick and shovel to remove it. Ice in the flange-way is a serious hindrance to the running of trains, and is the frequent cause of accident. With scrapers attached to cars, track may be cleaned as often as necessary, which is a matter of the greatest importance to winter traffic on snowy roads. Some of our roads are equipped with admirable machinery for clearing track from snow and ice, but not a few roads are sadly lacking in this respect, and not only the companies but the public are losers thereby.

It is now time to look about and see what may be done to prevent destruction of bridges and embankments by ice gorges. There are various ways of protecting these structures from freshets and ice gorges, the plans varying according to circumstances. The size of the stream, surface of the country it drains, currents, channels, nature of bed of stream, manner of construction of piers and abutments, superstructure, etc., should be thoroughly considered before adopting measures for the protection of the works. Either walls, piers, cribs, piles, rubble, rip-rap, or booms are needed in many places as measures of safety, and it should not be forgotten that "delays are dangerous."

There is an unusual quantity of ice to get rid of when the streams break up, and more than usual precautions are necessary to prevent serious trouble from that source. It is frequently advisable to cut the ice between the abutments of bridges to prevent the masonry being injured by the tremendous pressure of the expansion of ice in severe weather. When there are indications of a break-up, it is best to cut the ice and open the channel in the swiftest current for some distance above and below the works, with a view to giving floating ice an easy passage.

In breaking up large bodies of ice it might not be a bad idea to use some of the explosives now in use, and now is a good time to experiment; but don't get the nitro-glycerine too near the masonry, and remember what the poet says about distance lending enchantment to the view.

It is noticeable that on many roads but little attention is paid to keeping fish-bars tightened up, and on some roads bolts are missing from nearly every joint. Many of the joint fastenings are poor affairs at best, when all the bolts are in place and properly screwed up, and it is hoped that some genius will soon bring out a better joint support than can be found on most roads. There are some very good fastenings in use on some roads, but for some reason they do not get into as general use as they should. One cause of so many bolts being out is that they are screwed up too tight for cold weather, and many of them are nearly twisted off with the long wrenches in use, when a slight strain breaks them. Perhaps the best fixture on this account is the strip of wood interposed between the fish-bar and washer. This plan has been adopted by Mr. Latimer on the New York, Pennsylvania & Ohio road, and I believe is satisfactory. In

screwing up the nut the wood becomes compressed, and in gradually yielding to the pressure there is no danger of twisting off the bolt, and the elasticity of the wood compensates for contraction and expansion of bolts, and by its constant pressure prevents the nuts from jarring loose.

A year ago the writer recommended in the *Railroad Gazette* the use of salt on frogs and switches, and on the steps of cars and stations, and also in the flange-ways of farm and road crossings. This will prevent many hard falls and broken limbs, and save trouble from ice in switches, frogs and crossings. This is one of the hints that will bear repeating from year to year, like some of those in the almanacs.

There is a great deal of new track being laid this winter which should be ballasted if possible before spring. There has been but little snow, and the road-beds have been and probably will remain hard during the winter, which will be favorable for ballasting. Where clean gravel or rock ballast is used it can be handled in freezing weather, and track can be raised with a much smaller force now than when it is embedded in mud and clay in the spring. Even a foot or two of snow can be removed from the road-bed with scrapers, and tracklaying and ballasting done to a good advantage on frozen ground.

W. M. S. HUNTINGTON.

Calculating Quantities in Earth Work.

MILES CITY, Montana, Dec. 27, 1880.

TO THE EDITOR OF THE RAILROAD GAZETTE:

Your correspondent, Mr. S. E. Reaugh, in a communication on page 654, proposes "a form of prismatic formula so condensed as to be preferable, as a labor-saving formula, to the ordinary method of averaging end areas." It may be preferable in some cases for other reasons, but hardly on the score of labor-saving.

By a careful comparison with the following method, I find his will require from one-fifth to one-fourth more figures, without the advantage of having the end areas for use in making monthly estimates, etc.

Taking his example and arranging his factors as below for computing end areas, leaving sufficient space between the lines to add corresponding factors, we have:

Station	Factors.	Products.	Areas.	Yds.
61	$\frac{4.2}{2} \times 17.5 + \frac{12}{4} \times 11$	36.75		
	$22.6 \times 45.3 + \frac{12}{2} \times 42.6$	511.89	767.49	513.2
+ 70	$\frac{18.4}{2} \times 27.8 + \frac{12}{4} \times 31.6$	275.76	44.80	310.56
				1187.80
				$\times 70$
				63146.0
				27) 13857.6 (513.2

This method is applicable to all forms of cross sections, whether having intermediate heights or not. If the factors are arranged in the same order at each cross section, it is only necessary to add corresponding factors in order to obtain those which produce four times the middle area.

However perfect this method or that of Mr. Reaugh may be, neither has sufficient advantage over that of using end areas, and applying corrections, to render them generally popular.

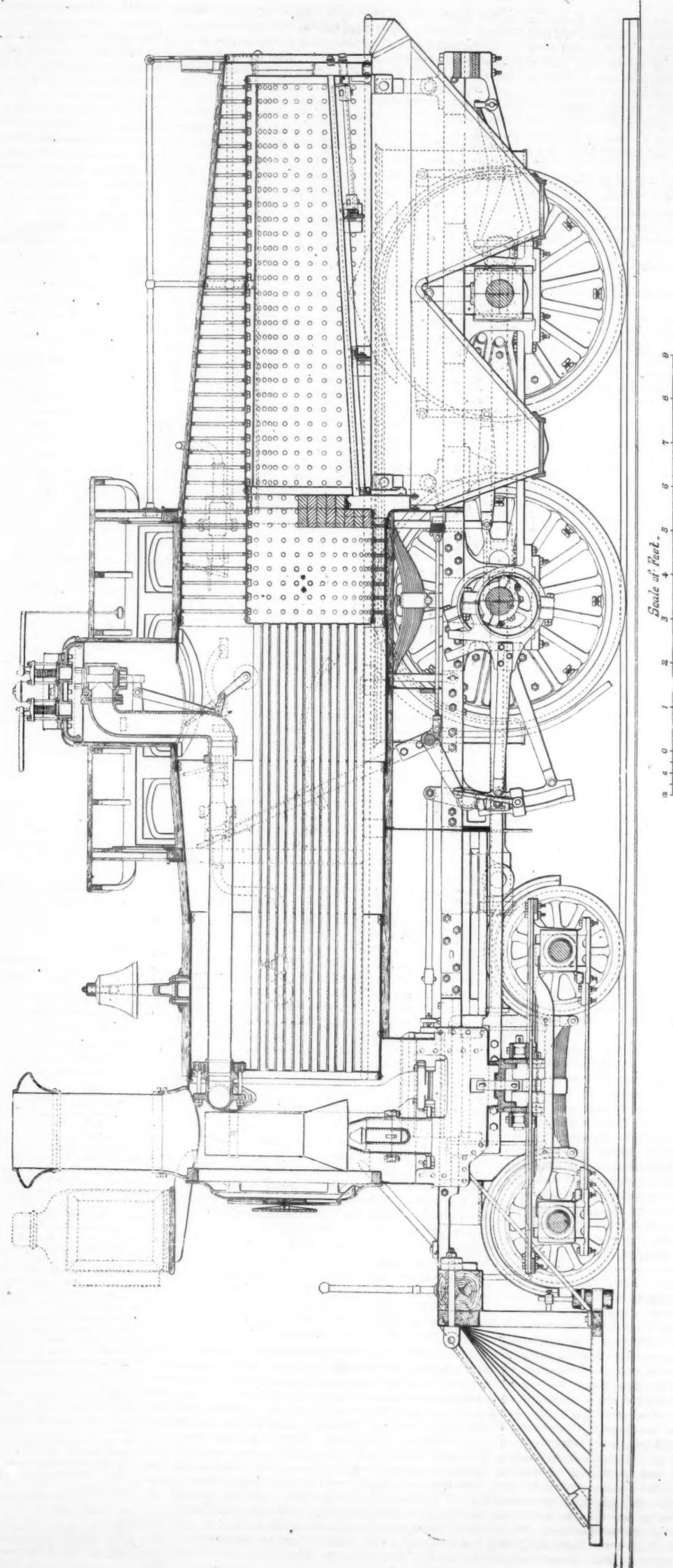
J. T. D., Northern Pacific Railroad.

The Telegraph Combination.

Just before we go to press this week a consolidation of the new American Union, the Western Union and the Atlantic & Pacific telegraph companies is announced. In lieu of other comment we copy the remarks we made in our issue of Aug. 24, 1877, at the time of the combination of the Western Union and the Atlantic & Pacific.

The telegraph war has at last ended, as doubtless was intended by those who began it, by the virtual consolidation of the Western Union with the Atlantic & Pacific. The result is almost inevitable when competition is attempted between two telegraph companies which cover the same field, and unfortunately circumstances make such competition unusually easy in the case of telegraph business. When a new company attempts to compete with the Western Union on ground occupied by the latter, if the old company has followed ordinary business instincts it has supplied the facilities required for all the business which will pay at the places where it has offices. Whatever capital may be invested by the new company in an attempt to serve the same places, therefore, is so much added to the necessary investment, and if both companies do a profitable business, then their customers pay more for interest on their investments than would be necessary if there were but one telegraph company. More than that, the expenses of the old company are very little reduced, even when a considerable portion of its business has been diverted to the competing line, and the expenses of the two companies are much greater than those of one doing the work of both would be. If, then, rates should be made to just cover profits and 6 per cent (or any other) rate of interest on the capital invested, the very first effect of a competing telegraph would be to raise the rates. However, as is well known, the reverse is the fact. At points where they compete the two companies do business at cost, or much below cost. The new company cannot hope to make any profit unless either it does more business than the old one per dollar invested, or does its work at lower cost. It is commonly charged that the capital of the Western Union is largely in excess of the value of its property, and probably enough that this is true—at least, the effect of such competition as that of the Atlantic & Pacific is inevitably to make it too large. On the score of expenses it is not probable that a new and small company will do any better than an old and large one, and in all cases the chief part of the earnings goes for expenses.

But if a new company has little power to make profits for itself, it has great power to destroy the profits of its competitors. Most telegraph business comes from the large cities, and a comparatively small investment will pay for



LONGITUDINAL SECTION OF FAST EXPRESS LOCOMOTIVE WITH J. E. WOOTTENS FIRE-BOX.

Built by the Philadelphia & Reading Railroad Co., at Reading, Pa.

lines between the leading towns. Thus so long as it can pay expenses a new company without a very large capital can very greatly injure a rival, however old and well established. So, though the old company may have no use for its rival's lines and other property, it will very much desire to get it out of the way, and unless it can actually kill it by competition—by making all its business worth less than its cost—it will finally be greatly tempted to pay something merely to get it out of the way; indeed, if it bankrupts it by competition it has to do substantially the same thing; it must buy the bankrupt lines else they will again spoil business in a new owner's hands; the difference is that if the competition ends before bankruptcy the proprietors of the new line get better pay for their investment—sometimes, indeed, very high pay.

It is now doubtless inevitable either that the interest on telegraph investments be less, or that the rates paid for telegraphing be higher than would have been the case if the Atlantic & Pacific had never entered the field against the Western Union. Virtually the effect of its competition has been to increase considerably the necessary investment in telegraph property in this country. And, what is most regrettable, the next great scheme of competition will start with chances fairer than ever. If the Atlantic & Pacific could hope to succeed because it could provide lines at much less average cost than that of the Western Union lines, the Coming Telegraph Company's hope will be stronger now that the Atlantic & Pacific investment is added to the Western Union's. And doubtless its projectors will reason that if they cannot make money from their business, they will at least be likely to sell out at a profit to the Western Union. If they have nerve and capital, they can spoil its business if it does not come to terms; and if it does come to terms, then we have the investment of the Coming Telegraph Company added to that of those which have preceded it—a totally unnecessary addition to the capital on which the telegraph business of the country will be made to pay interest if possible.

Is there any end to this process? If telegraphs were as costly as railroads, it would be too dangerous to tempt even the most daring of speculative capitalists. But telegraphs are easily made without very great cost, and one with a few offices may spoil a good deal of business. The process of constructing new lines for the purpose of compelling the old ones to buy them has been going on with the Atlantic cables down to the present day, with the effect of largely increasing the cost of messages, however it may have been with the price so far.

It is this readiness with which the cost of the telegraph system may be increased by additions which are not needed that gives the chief strength to the scheme for a government telegraph. The dangers of a corporate monopoly may be more considered by the community, but they are less than the dangers of competition in the form which it so frequently takes in telegraph business.

The Pullman Suit Against the Baltimore & Ohio.

On the 3d inst. Judge Bond, of the United States Circuit Court delivered the following decision refusing to grant a preliminary injunction to prevent the Baltimore & Ohio from running its new sleeping cars over its road. It must be remembered that the suit is yet to be tried, and the decision means only that the infringement is not so palpable without trial as to warrant an injunction without further hearing, when the defendant is abundantly responsible for any damages he may cause:

Upon reading the affidavits and the other papers in the cause, we do not feel warranted in determining any question of violation or infringement between these parties, but will confine ourselves to the motion before us. The proofs shown us upon the hearing are all *ex parte*, there has been no cross-examination of witnesses; and, take it altogether, the violation of the complainant's patent does not seem to us so clear and without doubt as to authorize us at once to issue the injunction prayed for. The interests involved on each side are very great, and were we to grant the motion upon evidence of the character now furnished by the complainant, contradicted by evidence of as low a grade by the defendant, we might do as much irreparable injury as we are asked to prevent. This is a matter addressed to the sound discretion of the Court. It is not a matter of course, upon the presentation of a patent which *prima facie* establishes the right of the patentee to the thing patented, accompanied by an allegation that the defendant is violating it, that a preliminary injunction will issue, but it must appear likewise that if the writ of injunction does not now issue the complainants will be irreparably injured, and that no subsequent decree of the Court can sufficiently ascertain and make good their damages. For ten years the defendant company has under contract of the complainants been running sleeping cars of the complainants over their road. It has now built certain cars of its own, as it is alleged, after the patent of the complainants, which it proposes to run over the same line of road. What irreparable injury does this cause? The profits accruing to the complainants for the use of the cars of the complainants hitherto run by defendant under the contract between them are known, and there can be no difficulty in ascertaining the loss to complainants by the use of the cars defendant proposes to run. But to grant this motion upon these *ex parte* affidavits would be to unnecessarily deprive the defendant of the use of a large capital invested in the building of these cars before the question of infringement is adjudicated. If the defendant company were insolvent and not answerable in damages, it will afford strong reason for the present influence of the courts, but this is not pretended. It is alleged and urged strongly upon the Court in argument that the complainants have a system of contract with a large number of railway companies in the United States to run the cars manufactured under this patent exclusively over their roads, and that to allow the defendant company to run its own cars over its road and those connecting with it would induce other roads to do the same thing in violation of their patents. We do not see how this fact, if it be true, ought to induce us to grant this motion upon the evidence presented. If the complainants have contracts with other railroad corporations for the use of their cars, the refusal of the defendants to enter into a contract can in no case affect their validity. If it be urged that the use by the defendant of its own cars breaks the unity of the Pullman

system, the proof shows it never was universal: that many trunk lines of railway have not entered into the system, and it does not appear to us to be shown to promise any such immediate and irreparable damage if the defendant company does not so enter as would warrant us in granting this preliminary injunction. We decline to grant this motion, therefore, first, because upon the character of the evidence furnished we are not prepared to determine the extent or validity of complainant's patent or their infringement; second, because there is in our judgment no case presented of such threatened immediate and irreparable damage as would warrant us in depriving the defendant by a final hearing of the use of the cars it has built; and third, because in the judgment of the Court whatever damages the complainants may suffer between the filing of this bill and a final decree can easily be ascertained upon

Fitchburg, so that while the Lowell agents might have been hunting up the goods described upon their way-bill, the Fitchburg people have been surprising the receivers with notices that their lots were in the possession of that road. The through western butter train, which comes into St. Albans from the Grand Trunk road, under a specific contract to enter Boston via the Lowell, was this week sent via the Fitchburg, as was the Ogdensburg butter train, which was also way-billed to the Lowell. Lumber from Ottawa and Ogdensburg, to be shipped from Mystic Wharf, has had to be hunted up on the Fitchburg sidings and sent over to the Mystic delivery at an additional expense of \$5 a car to the receiver, who, if his lumber had come down the Lowell route, would have had the benefit of this reshipping point at no additional expense. The Vermont Central cat-
the train of Tuesday last, on reaching White River Junction, was switched to be forwarded on the Cheshire route, but the drovers, who all have their feeding station at West Lebanon, on the Northern route, left the train at the switching point, declining to return unless the cattle came the old route. After a long delay, the drovers standing out, the train was sent upon its usual route, and they now decide to compromise and help the Vermont people in establishing the Cheshire route.

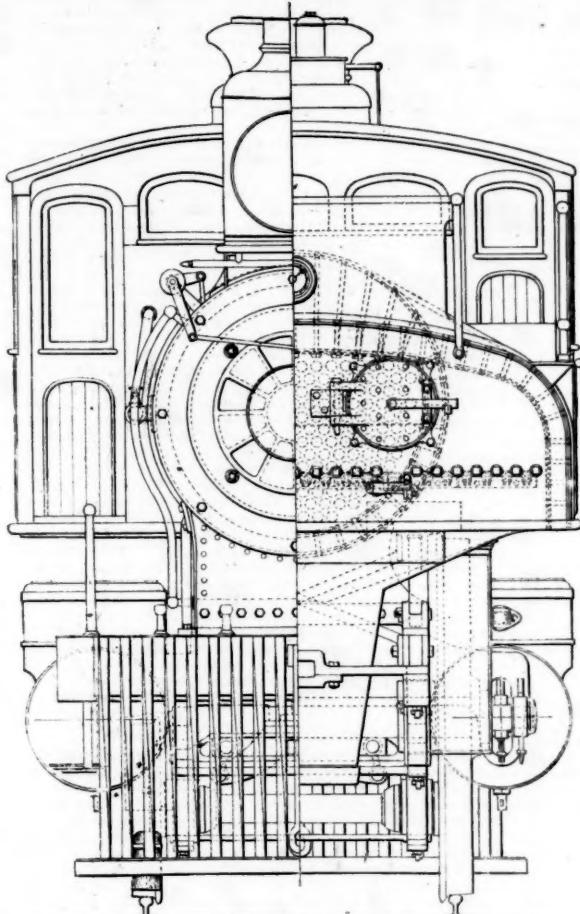
The causes that have led to this difficulty arise chiefly out of the fact, as has been previously stated, of the sale by the Northern road of its Sullivan branch (the road from Windsor, Vt., to Bellows Falls, Vt.) to the Connecticut River Railroad. This bit of track is the connecting link for the all rail New York traffic of the mountains and the North, going through Connecticut. The Central Vermont, having close interests with the New London, has turned all this business to this route, and while seeking to force the Northern road to a more favorable lease of the Sullivan branch, has been making surveys on the Green Mountain side of the river, and there threatening to build. With an expectation that such a new route might be established, and under the stimulus of a chance to sell this short strip at a profit of \$400,000, the Northern road parted with the Sullivan, subject to the operating lease held by the Central Vermont. This was in August last. The \$700,000 was paid in cash, and the Central Vermont is still in possession, although the lease is terminable on three months' notice.

When, early in December, the Allan line of steamers made Boston their terminus, the Central Vermont secured the rail traffic to and from the North. As this line has sailed from two to three steamers a week, the business has been large. But the Northern, Concord, Nashua and Lowell roads have been very certain that not over 60 per cent. of the down freight has come their way; whereas under the conditions of the through rates, all the business should have been theirs. This fact, together with the demands of the Central Vermont for a daily payment on all freights delivered to it by these roads, and a withholding by the Central Vermont of the amounts due to them on freights it had delivered, and one of these roads making the demand that the Central Vermont should pay interest on this debt, has led the Central Vermont to its present policy to withhold from the Northern road a share in the through traffic. The demand for interest, however, was not from the Northern road. There is a good deal of activity among New Hampshire and Massachusetts railway managers to rid their lines of the oppressive car-service charges coming with the business connected with the Central Vermont, and now that the latter road has voluntarily broken its line, and forced its business unsolicited upon another route which is itself heavily crowded with business, the outlook, as railway men express it, is

very encouraging for an entire revolution in the Vermont railway car supply business. Until this question is adjusted, Boston business men are likely to be embarrassed, although there is a probability from the projects discussed by the Connecticut River, the Delaware & Hudson, Northern, New Hampshire, the Concord and the Boston & Lowell, that within the next six months the grip on the northern traffic may be weakened. The breaking up of the Central Vermont business over the Lowell and the New Hampshire roads, it is asserted, is not regretted by these corporations. The terminal charges which the Lowell road earned has made on the average a small profit; but it is authoritatively stated that the hauling to all the roads has been unprofitable. The low rates, drawbacks, commissions and line agents' expenses have been a heavy tax. The loss of the many profitable through billing points in New Hampshire and Maine which the Central Vermont had by their Northern Railroad connection, and the thorough organization of the Boston, Concord & Montreal air line, which covers the Passumpsic and Southeastern in northern Vermont, and so reaches Quebec, Montreal, Ottawa and the west, renders the other New Hampshire and the Lowell roads very strong in their present stand. The new deal leaves the Northern out of the present through traffic business, but in the future, with a short line of not more than 20 miles, connecting Claremont, New Hampshire, with Rutland, Vermont, the value of the Northern is certain to be enhanced, and its importance as a connecting link with the Erie and Delaware & Lackawanna routes is sure to be great. When this is accomplished the Lowell road will have its Massachusetts Central running to the Hoosac Tunnel, thus it is assured three outlets for the north and west, independent of the Central Vermont.

Just how the business houses, annoyed by the transfer of their business from the terminus of one road to that of another, are to secure return, if they must use the Central Vermont without being subjected to the high local tariff of this road on deliveries to White River Junction, is just now a perplexing question. The value of Mystic wharf to the lumber, flour, grain, coal and hay trade has been already fully presented; and its advantages with the refrigerator at the Lowell yard, holding ten cars of butter, kept at a uniform temperature by 85 tons of ice, and the best of its kind in the country, and the immense butter and cheese cooling rooms under the three-story brick grain elevator, the trade will try hard to secure. Another matter of interest in the business is this: There is an irregularity about accepting cars at one terminus distinctly billed to another. The question of the propriety of breaking the English government seals on cars that have been thus turned from the destination that Canadian authorities have indicated, is one yet to be determined.

—Mr. George Tyson, formerly General Auditor of the Chicago, Burlington & Quincy, and long engaged in railroad business, died in Germantown, Pa., Jan. 7. He was born in New Bedford, Mass., and until recently lived in Boston.



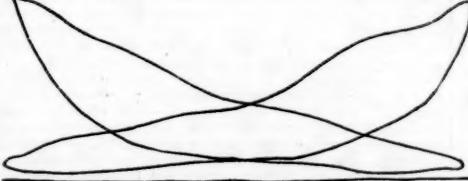
END VIEWS OF FAST EXPRESS LOCOMOTIVE, WITH WOOTTEN'S FIRE-BOX.

reference, for which damages, when determined, the defendant company is abundantly responsible.

Locomotive with J. E. Wootten's Fire Box.

We give this week, as promised, sectional and end views of this locomotive. The general dimensions were given last week, and some criticism of the design will be found on the editorial page, and a discussion of the stability of the engine in a paper elsewhere. The engravings require no further description.

Below we give an indicator diagram taken on this engine



INDICATOR DIAGRAMS.

with a train of seven passenger cars at a speed of 65 miles per hour. The diagram was taken with the reverse-lever in the second notch, and cutting off at $8\frac{1}{2}$ in. of the stroke. The boiler pressure was 125 lbs. per square inch, and the exhaust orifice $5\frac{1}{4}$ in. diameter. The vertical scale of the diagram is 80 lbs. per inch.

The Central Vermont and Northern War.

The Boston *Advertiser* of Jan. 11 has the following statements concerning the trouble now existing between the Central Vermont and the New Hampshire roads:

Produce, lumber and cattle dealers have been very much disturbed through the week by the persistent policy of the Central Vermont Railway in diverting shipments from the Lowell to the Fitchburg Railway terminal. This change of destination has been made without previous notice to the shippers or receivers, so far as can be learned by a canvass of a majority of these traders here in Boston, and the consequent embarrassments and delays have been equally annoying to all parties in interest. Way-bills distinctly printed "via Central Vermont, Northern and Lowell Railway," issued and signed by the roads feeding the Central Vermont, have not deterred the management of the latter from sending the merchandise via the Cheshire and

The Massachusetts Commissioners on Railroad Regulation.

The following letter from the Massachusetts Railroad Commissioners in reply to the communication of the New York Chamber of Commerce Special Committee of Transportation (the same that Judge Black's letter responded to) has been published:

GENTLEMEN: Your interesting communication of August, 1880, with accompanying questions and exhibits, has been received and considered with the care which the importance of the subject demands. We take pleasure in replying as individuals. Officially we cannot act, as the state has not commissioned us to do so, and you will understand that we speak for ourselves and not for Massachusetts. We need not apologize, because we shall refer so often to the statutes, decisions and practice of our own state. We understand that you desire from each correspondent such information as lies more especially within his reach.

There is no doubt that railroads should treat all shippers with equality under like circumstances, and with relative equality where circumstances differ. And discriminations against individuals and communities should be prevented by each state passing laws forbidding such discrimination under heavy penalties. Such laws will be better enforced if a Railroad Commission exists in each state, which, among other duties, will investigate charges of discrimination, bring public opinion to bear upon offending corporations, and, if need be, direct prosecutions in the courts of law. It is not consistent with public welfare and the rights of citizens to allow railroad managers to decide what persons shall be favored, and what places developed by discriminating rates. The legislature never intended to place this enormous power in the hands of its corporations. It may be doubted whether any legislature has the constitutional right to delegate such power. This question of preference for places and persons was decided in England in a series of cases by the late Chief Justice Cockburn, at a time when the working of the railway law was intrusted to the Common Pleas Court. Lord Cockburn was a jurist who, when unaffected by passion or partisanship, was superior to any living judge in England. And decisions in favor of the people and against corporations which are good law in England certainly ought to be sound law here.

The principle that railroad companies are public corporations is fully established in this state. And they have always been subjected to government control in the interest of the public. The Supreme Court say: "The conferring upon the railroad corporations the power of carrying freight and passengers has imposed upon them, to some extent, the correlative duty of carrying them at reasonable times and for a reasonable compensation, subject to the revision of the Legislature. * * * The construction of a railroad is not a private enterprise. The corporation exercises the right, or the Legislature through the corporation exercises the right to take private property for the road on the ground that the use is a public use, and the road itself a highway for public travel. On no other ground could the exercise of the right of eminent domain by or through these corporations be upheld.

HOW IT WORKS IN ENGLAND.

The English system of regulation by railway commissioners works excellently. The best proof of this is the fact that now few complaints are made before it. The existence of such a tribunal and the knowledge of its powers, remove the causes of complaint. It makes justice prompt and cheap, and brings it near to the people and to business men; and it is found that such a commission is better fitted than the courts of law to deal with questions that arise between shippers and railways, or between different companies. Every state should, in our opinion, have a tribunal of this kind; and if it is impossible in any state of this Union that such a commission should do its work, because of the extent of the evil to be remedied, or because of the aggregate wealth opposed to the redress of abuses, this shows that in that state good government has become impossible, and that self-government there is a failure. We cannot believe that this is true of any state.

We do not believe that a fixed limit can be placed in advance on the charges of railroads. The circumstances of each differ; and the rule which would be right in one case, would do injustice in another. With such a tribunal as has been spoken of, with full power to examine all contracts and all the doings of corporations—always easy of access by the people, and ready to investigate thoroughly every complaint, justice can speedily be had. The recommendation of the board will generally be heeded by the railroad companies. Or, if it is not, it will be heard by the Legislature, to which those companies are amenable. The rule laid down by the law is that charges must be reasonable; and this rule should be adhered to. The form of your question assumes that "railroad managers" adopt the new rule of charging all that the traffic will bear. Perhaps it would be more just to say that this of some managers. It certainly is not the rule of law.

A FIXED RULE NOT DESIRABLE.

The peculiar circumstances of the legislation fixing the maximum for passenger rates on the New York Central make it an exception. A fixed rate per mile applied in advance to all freight charges would work hardship, injustice and inequality. Freight can be hauled more cheaply over a long route than over a short one. Charges should be lower on a road doing a large business than on a road doing a small business. Grades, costly bridges, and expensive terminals are to be considered in fixing rates. Equality in rates would often produce inequality in results. The limitation of profits to 10 per cent, seems to be just in principle, but has hitherto succeeded only in taxing the ingenuity of railroad men to devise means for evading it. Cases can be imagined where it would be unwise in policy. Wherever the principle is adopted, it ought not to be evaded by any false basis of cost or any form of watering. If the surplus earnings were rightly earned and legally expended in making needed improvements at honest prices, there is no reason why dividends should not be paid on the cost of those improvements. If those earnings had been paid to stockholders in the form of dividends, and reinvested by them in new subscriptions for stock, no one would doubt this. The principle is not different when they are directly invested in improvements really adding to the value of the road, and the convenience and safety of public travel. If there was evasion of any law in keeping these earnings, that was the original sin which it would be hard to reach now. If surplus earnings were gained by unreasonable rates demanded and received, it certainly is too late to remedy this permitted wrong. There is no difference of opinion among honest men as to the watering of stock by any device by which a fictitious basis of value is established. It is forbidden under heavy penalties in this state.

In answering the questions as to the legislation to secure reasonable and equal rates for freight and passengers, we have spoken only of state legislation. And we consider the appointment of railroad commissioners as the most practical measure needed for the enforcement of the rights of the people. As has been remarked before, principles of law that had long been settled seem to have been regarded as

open questions by leading railroad managers. It has been considered by them as hazardous to adopt by legislation rules of the common law which had been fixed for centuries, and which have long since been applied to railroads in this country. The chief need has been a tribunal easy of access, inexpensive to the party wronged, and not encumbered by the machinery of legal forms.

OPPOSED TO NATIONAL LEGISLATION.

The matter of national legislation is a graver one. It is not so much a constitutional question as one of policy as to the use of constitutional powers. Certainly evils exist which it is hard to remedy by state legislation. But greater evils may be incurred by calling for national legislation. If it is once begun to be exercised, such legislation would affect not only roads running from state to state, but all roads connecting with such routes, so that the smallest branch in the obscurest hamlet would have a portion of its business controlled by the central power of our government. It would be a strain on a government like ours to have the direction of \$5,000,000,000 worth of property placed in its hands. It is said that four companies, and indeed four men, now control a vast proportion of the transportation business of this country. Is it not possible that their influence might still control it if it were directed by Congress? And would it not be easier to control it through one legislative body than through many?

The danger of combinations between different states and sections is so obvious that it hardly needs to be mentioned. The regulation of freight charges could easily be managed, so as to cut off certain ports and states from all export trade. A favorite project, for instance, is a fixed rate per mile for each ton of Western grain carried east. This would render it impossible to ship grain from certain Eastern ports. Is there not a possibility of legislation of this kind? There would also be danger in exciting times politics might sway the action of Congress. It is plain, that the business of one part or one whole section might be increased as a mark of favor, or starved as a penalty. There have been periods in the history of this country when a direct power to do this would have been exercised. No one can warrant us against a recurrence of such times and such feelings. The general effect of such an exercise of power upon the character of our government is a serious question. No other scheme ever discussed has proposed such a consolidation of power as this. A change in forms of infinitely less consequence would excite universal indignation among the people. If the control of \$5,000,000,000 were given to Congress, including the direction of untold millions worth of freight each year, our government would cease to be what it now is. We have barely indicated the peril that would attend such an assumption of power; and these perils begin to be incurred when Congress begins in any way to control the inter-state railroad traffic. It would be well, at least, to exhaust state legislation, and to attempt in all ways to control state legislation before taking the "heroic" and almost desperate remedy of subjection to national legislation. Even a National Railroad Commission would be dangerous, as implying a power of controlling transportation throughout the states, and as opening a way for further aggression on state rights, unless its power were carefully limited to the hearing of facts and the collection of information.

THE RIGHT OF RAILROADS TO COMBINE.

One word should be said of the supposed need of national legislation to promote what has been called the "federation of railroads." That system has been most ably advocated, and is now supported by the great names of C. F. Adams, Jr., and Albert Fink, and no higher authority on railroad questions could be given. But those who believe that the solution of our railroad problem is to be found in federation need not resort to national legislation, although Mr. Fink's language seems to imply that it is necessary. The railroad companies have full powers now to contract with each other, subjecting themselves to rules and to the decisions of arbitrators for any term of years; and those contracts will be enforced by the courts. It does not need that the federal government "legalize," still less that by a stretch of its powers it should "incorporate" organizations formed by railroad companies. Such self-government can be established without the authority of the United States. It needs no exercise of the law-giving power anywhere. If it be said that states will forbid such combinations, the answer is that the public opinion which could procure the passage of a national law permitting federation would certainly prevent the states from forbidding it, and that even the courts, upon a question of public policy, are liable to be affected by public opinion. If it is thought that the officers of such organizations can enforce their own decrees without the intervention of courts, the answer is, that in this country it is impossible. Ultimately, with or without legislation, the final resort in case of difference of opinion or resistance to a decision must be to a court of law. But with or without legislation, the best strength of such a system is found in the fact that its commissioners and arbitrators are men of such intelligence and such character that their decisions need no tribunal to execute them. Such is the case at present, and no legislation could add force to the decisions of the tribunals voluntarily established by the railroad companies.

This reference to a supposed method of escaping many evils of our present system seemed necessary in order to a general view of the subject. We will only add that the sending of this reply has been delayed, in order to obtain the concurrence of a member of the board absent on official business. The letter of Judge Black has been made public in the meantime. But we have not thought it necessary to strike out that portion of our communication which has been anticipated by him. Very respectfully,

THOMAS RUSSELL,
ALBERT D. BRIGGS,
EDWARD W. KINSLEY.

The Metric System Again.

In our issue of Dec. 24 we copied a communication on this subject signed "F. B.," which was a reply to Mr. Seller's paper, and originally appeared in *Engineering News*. A writer in the Boston *Journal of Commerce* answers back. The following extracts are from the latter article:

In commenting on Mr. Seller's paper "F. B." says "he mentions seven scales which he says emphatically are the only ones we can use for metrical drawings, and complains that these are not enough." Then, quoting Mr. Seller's assertion that "the jump from one-half to one-fifth size is unfortunate. If we could conveniently (the italics are our own) quarter the whole size, we would have an increased area section, a matter of much moment." He continues: "Then, why in the name of reason should we not do so. We can use a scale of 25 per cent, of full size, as conveniently as we can use a 25 cent piece or a 2½ dollar piece in federal money. Does not Mr. Seller know that our currency is decimal? Well, take what he does know: The metric system is nothing if not decimal; and the graduations of any metric scale, which on one drawing represent certain dimensions, on another drawing per-

fectly represent ten times those dimensions." Then he goes on to prove (?) his position by using one of the seven scales mentioned by Mr. Seller, and, by continual doubling, presents a series of scales, having the peculiar merit that each is twice as large as the next one, which he intimates is what Mr. Seller deems essential. The scales he thus builds up are:

.025 .05 .1 .2 .4 .8.

These tests in vulgar fractions are:

$\frac{1}{16}$ $\frac{1}{8}$ $\frac{1}{4}$ $\frac{1}{2}$ $\frac{1}{1}$ $\frac{1}{2}$ $\frac{1}{4}$
Drawings made to constructed scales such as "F. B." suggests can only be conveniently read by means of the rule used in construction. The metric rule of commerce is divided into centimeters by long marks, into half centimeters by shorter marks, into millimeters by still shorter marks of uniform length, and the finer rules used by engineers have these millimeter spaces cut up into five parts each. Thus the whole scale presents the smallest divisions in groups of five. Mr. Seller gave the five scales used in metric countries, all of which can be read from any well divided metric rule as compared with the many scales which can be read from a well divided inch rule as used here. A metric rule constructed as usual down to the millimeter division, and these minor spaces subdivided into four equal parts, will give a rule capable of reading a drawing made quarter size, because each of the five divisions will stand for one whole millimeter of the reduced scale. This, however, means a departure from the rule in its perfect simplicity. German draughtsmen use the fifth scale because they or any one else can read the drawing with comfort by means of the rule of commerce.

It may be said that Mr. Seller holds that several of the seven scales he names must be constructed, then why not construct all? The construction of these small scales is, we understand, for convenience, and is not a necessity. Every one of the scales mentioned by him, with, perhaps, the single exception of the one-twenty-fifth size, can be read in the rough, for the purposes for which such small scales are used, from any well divided metric rule. The one-twenty-fifth scale reads four millimeters to one decimeter; it is not easy to read consecutive groups of four on a rule divided into groups of ten by long marks, and into groups of five by shorter ones. Let any one who does not already know this try the experiment. We think he will see the force of our remarks, and prefer a constructed scale divided into groups of four, or rather having spaces clearly marked as units, each of these units then subdivided into ten each. It is a rule thus constructed that "F. B." submits as an answer to Mr. Seller's objection to the metric scale at the drawing board. Mechanical drawings during their process of construction present no figured dimensions for guidance. The figuring on the drawing is the last operation, after it has been inked in. Until it is figured it is readable only by means of a scale of proportions. Most shops insist that their drawings shall be made to scales readable by means of the two-foot rule, when on the inch scale, and by the metric rule pure and simple, the drawing is made to millimeters. A drawing made to the largest of the scales proposed by "F. B." viz., the four-fifth size (we hope he will pardon us for reducing his noble decimals to vulgar fractions), has some dimensions that read on an ordinary millimeter rule say 354mm. How are we to know what this stands for in the full-sized machine? Why we have only to divide the dimensions so read by 0.8, or to multiply it by five and then divide the result by four. By either process we obtain 442.5; now, as we know half millimeters are not in any ordinary set of shop sizes, we infer that the space measured stands for either 442 or for 443. As for any man being able to judge of how a piece drawn to $\frac{1}{2}$ scale will look full size, we are inclined to be sceptical. We do know that it is within the limits of ordinary minds to double, halve, or to quarter, we may say even to treat as thirds, either up or down, a scaled drawing, with a fair assurance of his being able to feel in his consciousness the true size or dimension of every part, but we doubt the ability to so increase or diminish by $\frac{1}{2}$, etc., without translating into full size in figures and then thinking what those figures mean. One of the great advantages of a rule sub-divided by a process of continual bi-section is that it gives to the draughtsman the radius of all the diametrical distances with such perfect ease and certainty. The radius of 400mm. is 200; this is simple enough, but the radius of a circle, 399mm. diameter, is 199.5, requiring the half millimeter on the scale the drawing is being made to, for the ready spacing of the dividers.

"F. B." says, in reference to Mr. Seller's treatment of the metric system in the drawing room, "the subject of draughting and computing, however, he so before that a few simple words are in order." What we have given is the gist of these simple words, but they do not, to our mind, seem to come from one so familiar with the draughtsman's needs as does what Mr. Seller has given us to think about. "F. B." says, too, "that it is audacious for any one to say that the advantage of the inch series admits of no dispute." We would like to elaborate this very matter of the advantages of the inch series, because we think Mr. Seller, doubtless fearing to make his paper too long, has done only scant justice to its merits. "F. B." continues: "About computation, Mr. Seller's remarks are still less adequate, though not so audacious." We sympathize with Mr. Seller in the risk he runs in touching on that dangerous ground. If the metric system has any merit, it must lie in its value in facilitating all kinds of computations. In fact, we were, before reading Mr. Seller's paper, quite ready to confess judgment and let that case go by default. What "F. B." says in regard to the arithmetic of the machine shop, however, does not affect what Mr. Seller says. He does not show how calculations involving many figures can be made in shorter time than ones involving few figures. As the unit of the machine shop has, by common consent in metric countries, been fixed by the adoption of the millimeter, as the unit, and as more figures are involved in the designation of sizes by millimeters than is their average in inches and fractions, it seems but reasonable that the metric system cannot shorten the processes of addition, multiplication and of division. It is as if we were to abandon our inch and its division into sixteenths, and were to take the sixteenth of an inch only, and call it our unit, and then, in place of three or four inches, we should say 48 or 64. This has been done sometimes when formulating matters below the inch in size, but does not present advantages in dealing with long sizes.

The merit of a system cannot be proved or disproved by one or two examples in arithmetical calculations. "F. B." says it is not fair to compare the multiplication of 1.5m. \times 1.5m. \times 3m. with 5 ft. \times 5 ft. \times 10 ft., but says "for real comparison with what is now in use, let him take 1' 5" \times 1' 5" \times 3', and see whether his carpenter will reckon it in his head." Had Mr. Seller taken the example given by "F. B.," he would then have compared it with 432mm. \times 332mm. \times 915mm., or with the same numbers in the decimals of the meter. Mr. Seller used the examples in illustration of conversion of bulk into weight. It is unfortunate that he did not hit upon the combination suggested by "F. B." as it would have done him a good turn. We do not know very much about carpenters and their ability to calculate, but nevertheless the

many calls upon their ingenuity in the construction of buildings, often without any drawing to guide them, has led us to consider them rather above the average of mechanics in their readiness with figures. How the knowledge of the —well, we will say, average carpenter—will enable him to tackle this problem, will depend on his ability to multiply 17 by 17 in his head. If he has not learned the multiplication table up to 20 times 20, he can at least multiply 17 by 7 and hold the picture of the result, 119, in his head long enough for him to place the 17 under the 11 of the 119, and then add up this easy sum. The result, 289, will look so like twice 144, viz., 288, that he would most likely call the result two square feet, and finish this difficult problem with 2 by 3 feet equals 6 cubic feet. A draughtsman might do it more readily, because his two-foot rule is graduated on its edge to the decimals of a foot. And 17 inches reads 1.416, and this looks so like a certain quantity he never forgets, if he has had experience in drawing, that 17 by 17, to him, stands as 2 square feet. If "F. B." wants to know why the expression 1.416 looks so familiar, it is because it comes so close to 1.414+, which is the square root of two, and is therefore the ratio of the diagonal of a square to its sides. In the process of grinding into his mind all the things worth remembering, he fixes the fact that a square of two anything has a side 1.414+. All of these examples amount to nothing, however, in the way of argument. Mr. Sellers' experience has shown him, he says, no gain, the loss from the use of a small unit requiring many figures to express what is needed, taking away from the other advantages of the system when considered from a labor-saving point of view. Here is a plain statement of what he seems to consider a fact. If he is wrong, any one can satisfy himself in the way he has done; that is, use both for twenty years or so and then give up his experience.

The Massachusetts Railroad Commission on the Fall River Boiler Explosion.

We give below the report of the Massachusetts Railroad Commission on the explosion of a locomotive boiler on the Fall River Railroad on Nov. 3 last. In our issue of Dec. 31 a paragraph, copied from a Boston paper, appeared, which gave a very incorrect idea of this report. The full text of the document is as follows:

The witnesses in this case were examined immediately after the accident, but a decision has been delayed until the boiler could be personally examined by the Commissioners and by experts employed by them. This locomotive, the "Jupiter," was built at the Mason Locomotive Works at Taunton, in 1859; a new fire-box was constructed in 1871, it was "thoroughly repaired and overhauled" in March, 1879. Nothing was done at that time to the boiler, because it was supposed that nothing needed to be done.

On the morning of the accident the engine came out at 11 a. m. to start from New Bedford for Fall River at 12:15. The engineer reported to the Superintendent of Motive Power that a slight leak appeared on the wagon-top just above the foot board, and that water was slowly dropping from it. The lagging or jacket (wood work covering the boiler) was removed, and a leak one-half inch long was found. The lagging was relaid, and the engine was sent out on time, without objection by the engineer, and apparently without any hesitation on the part of the Superintendent. Another locomotive was sent for to take the place of the Jupiter on the next day and during repairs. The engineer was requested to keep the steam as low as possible. The usual pressure was 110 pounds to the square inch.

The engine went safely to Fall River, but while returning with one freight, one baggage and one passenger car, when crossing Long Bridge, over Watuppa Pond, an explosion took place, tearing the boiler to pieces, demolishing the cab and breaking the connection of the cars, but not derailing any of them. The fireman was thrown on the coal and was somewhat scalded. The engineman was hurled into the water, where the body was found the next day with a fatal wound on the head and face.

The following report, made by a most skillful and trustworthy expert, shows the cause of the accident. And his views are confirmed by still another expert, and by the examinations of the Commissioners:

OFFICE OF U. S. LOCAL INSPECTORS
OF STEAM VESSELS
BOSTON, Mass., Dec. 17, 1880.

"The Hon. Thomas Russell, Chairman Board of Railroad Commissioners:

"Sir.—In compliance with your request of the 8th inst., I carefully examined the exploded locomotive boiler at Taunton on the 14th, and beg leave to submit the following opinion as to the cause, etc.:

"First.—The initial point of rupture was evidently on the left-hand side of the wagon top on a line just above the horizontal diameter of the boiler, through a plate once solid and 5-16 in. thick, but from wear and tear reduced in the form of a crack from the inside to a very small proportion of its original thickness, and, at some points, to a mere skin on the outside. This crack extended the whole length of the wagon or fire-box part of the shell, 4-1/2 ft., and constituted a chronic weakness which was without doubt the sole cause of the accident.

"The elastic and divalent force of the steam, acting upon this large plate, suddenly detached for 4-1/2 ft., threw it upward and tore it mostly through the line of rivet holes at each end, running over and down the flat side opposite, pulling through 51 screw-stays, and there tearing itself clear from the boiler. This piece, which formed the entire crown of the shell of the boiler, including a dome 24 in. diameter, measures about 4-1/2 ft. by 8 ft.

"The primary cause of this old crack, in my opinion, was the deflecting and fretting effect on the plate, disturbing the fibres of the iron, with every material variation of pressure and expansion—due in this case to the arrangement of the bracing—and so the weakening process went on till the limit of endurance was reached.

"As a rational means of ascertaining that a boiler retains a margin of strength to enable it to safely withstand the strain of a given pressure, it should, at least once in every year, be subjected to a hydrostatic test of 50 per cent. beyond the every-day working steam pressure, at least. Had this been done, together with a careful, thorough and intelligent inspection, it is my opinion the weakness in this case would have been discovered and the disaster avoided.

"Very respectfully, ANDREW J. SAVAGE."

The boiler was not as strongly built as boilers are now. But the defect arose from a cause which is liable to affect all locomotive boilers, the wear and tear arising from their ordinary use. Against this danger we know no safeguard except the frequent testing of boilers by some one of the well-known and approved methods, that of cold water pressure being, in the opinion of the Board, best.

No record of any recent application of such test to this boiler appears. The proper application of such test at any time within a year would have revealed the defect, and would have prevented the accident. Such an occurrence does not

greatly affect the public, when only employés are injured, because it does not seem to endanger them. But it hardly needs to be said that the explosion of a locomotive boiler does imperil every one upon the train, and if it occurs at a station it may destroy those who have nothing to do with the road, and who have no idea of incurring any railroad danger.

The Board will once more recommend legislative action upon the subject of locomotive boiler inspection. In the meantime, it suggests to all railroad managers the expediency of annual tests.

The action of the Superintendent of Motive Power at New Bedford is next to be considered. It seems to the Board that he was in fault in sending out a locomotive when the boiler was leaking as this did. The partial examination made by him showed that the leak was not at a seam, but through the plate. The best that can be said is that he did not know whether it was in a dangerous condition or not. And this shows that the engine ought not to have gone out.

At the same time justice compels the Board to say that this official acted as other railroad men probably would have done, and heretofore have acted in like cases. The evidence is that it is not unusual to send out locomotives with slight leaks in the boilers. The testimony shows that he acted in accordance with railroad usage. But the Board condemns that usage, and holds that no engine should be sent out on the faith that such a defect will not prove dangerous. The train in such case should wait until another engine can be obtained, or till it can be made sure that there is no danger.

By the Board. WM. A. CRAFTS, Clerk.

Chicago Shipments Under the Pool.

The following interesting circular has been issued by Mr. Fink as Chairman of the Joint Executive Committee:

Experience has proven that the maintenance of rates on east-bound freight from the Western cities to the seaboard is not secured by the present divisions of traffic between the initial Western roads, and that this object can only be attained by extending to the "trunk roads and their immediate connections" the same arrangements for divisions of traffic. At present the motive for cutting the rates by the trunk roads and their connections is just as strong as though no division between the initial Western roads existed. With a view of facilitating a division of the Chicago freight traffic between the trunk roads, there have been prepared the following statements, viz.:

Statement No. 189—Showing the proportion of the Chicago freight traffic forwarded to the East by each trunk road during the various periods from June 9, 1879, to Oct. 31, 1880.

Statement No. 189 A—Showing the proportion of the Michigan Central Railroad Company's freight traffic forwarded to the East by each road during the various periods from June 9, 1879, to Oct. 31, 1880.

Statement No. 189 shows statistics for two periods of time.

The first period covers the various months from June 9, 1879, to May 31, 1880.

The second period covers the various months from Jan. 1, 1880, to Oct. 31, 1880, during which the Chicago & Grand Trunk Railway participated in the traffic, and to some extent changed the distribution, as shown during the first period. There will be found in this statement the tonnage to each city or district in the East, and the relative importance of the traffic to said city or district expressed in percentages of the total Chicago tonnage. Also, the traffic for said city or district received from each Chicago road by each trunk road expressed in percentages of the total Chicago tonnage.

The final results of the first period, from June 9, 1879, to May 31, 1880, are as follows, viz.:

The Grand Trunk Railway (east of Toronto) carried 5.80 per cent. of the total Chicago tonnage, of which there was received:

From the Michigan Central..... 5.19 per cent.
From the Lake Shore..... 0.11 per cent.
From the Fort Wayne and Chicago & Lake Huron..... 0.50 per cent.

Total..... 5.80 per cent.

The New York Central carried 38.83 per cent. of the total Chicago tonnage, of which there was received:

From the Michigan Central..... 19.14 per cent.
From the Lake Shore..... 19.69 per cent.

Total..... 38.83 per cent.

The New York, Lake Erie & Western carried 15.51 per cent. of the total Chicago tonnage, of which there was received:

From the Michigan Central..... 4.96 per cent.
From the Lake Shore..... 2.60 per cent.

From the Fort Wayne..... 1.31 per cent.

From the Pan-Handle and Atlantic & G. Western..... 6.64 per cent.

Total..... 15.51 per cent.

The Pennsylvania Railroad carried 26.48 per cent. of the total Chicago tonnage, of which there was received:

From the Lake Shore..... 3.45 per cent.
From the Fort Wayne..... 19.72 per cent.

From the Pan-Handle..... 3.31 per cent.

Total..... 26.48 per cent.

The Baltimore & Ohio Railroad carried 9.12 per cent. of the total Chicago tonnage, all of which was received from the Chicago Branch of the Baltimore & Ohio Railroad. The results of the second period, from Jan. 1, 1880, to Oct. 31, 1880, are as follows:

The Grand Trunk (east of Toronto) carried 10.73 per cent. of the total Chicago tonnage, of which there was received:

From the Chicago & Grand Trunk..... 6.80 per cent.
From the Michigan Central..... 3.81 per cent.

From the Lake Shore..... 0.12 per cent.

Total..... 10.73 per cent.

The New York Central Railroad carried 38.26 per cent. of the total Chicago tonnage, of which there was received:

From the Michigan Central..... 20.64 per cent.
From the Lake Shore..... 17.62 per cent.

Total..... 38.26 per cent.

The New York, Lake Erie & Western carried 19.28 per cent. of the total Chicago tonnage, of which there was received:

From the Grand Trunk..... 3.87 per cent.
From the Michigan Central..... 2.59 per cent.

From the Lake Shore..... 5.88 per cent.

From the Fort Wayne..... 0.69 per cent.

From the Pan-Handle and Atlantic & G. Western..... 6.25 per cent.

Total..... 19.28 per cent.

The Pennsylvania Railroad carried 20.99 per cent. of the total Chicago tonnage, of which there was received:

From the Lake Shore..... 1.87 per cent.
From the Fort Wayne..... 17.24 per cent.

From the Pan-Handle..... 1.88 per cent.

Total..... 20.99 per cent.

The Baltimore & Ohio carried 5.91 per cent. of the total Chicago tonnage, all of which was received from the Chicago Branch of the Baltimore & Ohio.

Statement No. 189 A shows statistics of the "Michigan Central Railroad's Chicago tonnage" for the same two periods of time already referred to in Statement No. 189. It is submitted for the purpose of enabling the parties interested to arrive at an agreement for a division of the Michigan Central Railroad's Chicago traffic between the Canada roads.

The final results of the first period, from June 9, 1879, to May 31, 1880, are as follows:

The Grand Trunk Railway (west of Toronto) received 18.82 per cent. of the Michigan Central's total Chicago tonnage.

The Great Western Railway received 0.10 per cent. of the Michigan Central's total Chicago tonnage (said tonnage being destined to Toronto).

The Great Western & Canada Southern pool received 81.81 per cent. of the Michigan Central's total Chicago tonnage.

The final results of the second period, from June 1, 1880, to Oct. 31, 1880, are as follows:

The Grand Trunk Railway (west of Toronto) received 14.40 per cent. of the Michigan Central's total Chicago tonnage.

The Great Western received 0.16 per cent. of the Michigan Central's total Chicago tonnage (said tonnage being destined to Toronto). The Great Western and Canada Southern pool received 85.44 per cent. of the Michigan Central's total Chicago tonnage.

The information given in statements Nos. 189 and 189 A furnishes sufficient data to enable the trunk roads and the Canada roads to come to an agreement for the division of the Chicago traffic. I would, therefore, suggest that, after the statements have been examined, each party interested notify me that they are ready and willing to proceed to a division of the traffic, whereupon I will appoint a day for a meeting of all the roads interested, viz., the six Chicago roads, the three Canada roads, and the five trunk roads.

THE SCRAP HEAP.

The Fontaine Friction Driver Locomotive.

The Detroit Post and Tribune, of Jan. 6, says:

"The new trucks for the Fontaine locomotive are at the shops on Grosses Isle, and Mr. Fontaine left for that place yesterday, his intention being to have the trucks placed in position within a day or two. The engine has been kept running on the Toledo Division of the Canada Southern for the last month, and is every day winning golden opinions from all who see its workings. Division Superintendent Murray is much pleased with the manner in which the engine does its duty, and he recently made the assertion that no standard engine on the road equalled the Fontaine in pulling capacity. A train of 38 loaded freight cars was, a few days ago, during the extreme cold weather, pulled over the division in quicker time than was ever made before under the same circumstances. It is said that the locomotive also effects a remarkable saving in coal. Since the day of the trip to Oxford on the Detroit & Bay City road the locomotive has made from 175 to 250 miles daily. The new trucks for the engine arrived some two weeks ago, but the business of the road has been so heavy that the Superintendent has been unwilling to lose the services of the locomotive long enough to have the change made."

The new truck has since been put in use and with it the locomotive has run at the rate of over 60 miles an hour on the Canada Southern.

The Governor of Pennsylvania on the Railroad Question.

Governor Hoyt, of Pennsylvania, in his annual message to the Legislature, says: "The relation of common carriers, more especially of the trunk railroads, to the commerce of the country has assumed a very important economic aspect. So far as the control of inter-state traffic is concerned, it must be remanded to the National Legislature. Our own statutes must terminate in their operation at our state lines. Within these lines, there are certain policies to be executed, so obviously just and right as to preclude question or debate. Our constitution has but defined them, and, by its mandate, provided the details of their enforcement. Your attention is called to the fact that this requirement of the constitution has not, up to this time, been complied with."

"That all shippers in the state may be in condition to have the protection of statute law, it is urged that you enact the necessary legislation so that the provisions of the constitution may be placed in reach of execution by the courts over all transportation companies, at all times, in all places and in all interests."

Changed His Mind.

There lately died in this state an old man who once held the position of Superintendent of a Michigan railroad, 26 miles long. The Superintendent, of course, knew that there were several other railroads in the United States, but he seemed to have the idea that he carried the whole railroad system of the country in his vest-pocket. Every employee was instructed to remove his hat when speaking to the great man. He insisted on his conductors wearing plug-hats, and once discharged an engineer for not having his boots blackened while on his run.

In the height of his career, the Superintendent was suddenly taken ill. He worried greatly for fear the trains would not come and go, if he were not at the depot, and in a week he was dangerously ill. At the end of a fortnight the doctor frankly told him that he had better prepare for the worst. In this emergency one of the conductors was sent for, and the patient began:

"Mr. Jones, I suppose the news has been telegraphed all over the country that I am dangerously ill?"

"I suppose so," was the answer.

"Is it generally realized that my death will be a sad blow to the railroad interests of America?"

"I presume it is."

"Has the news of my dangerous situation depressed our stock any?"

"No, I think not."

"What? Hasn't it sent our stock down a bit?"

"No, sir. On the contrary, it has gone up to 84."

"Then I'll see 'em hanged before I die!" gasped the patient; and in two weeks he was able to ride out.—*Chicago Tribune*.

Cattle Frozen to Death.

On last Friday morning (Dec. 30), when the freight train on the Delaware, Lackawanna & Western Railroad passed through Dover, a car load of cattle was left at the station for transfer to the Bonton Branch train, which leaves there at 5:25 a. m. Before the train started an examination of the car was made and fifteen cattle were found frozen to death, among them several heavy beevies. On taking the dead cattle out of the car several live ones were found underneath them, they having worked their way under the weaker ones for warmth. The cattle came from Port Jervis, and were shipped to parties in Hoboken, Newark (N. J.) Advertiser.



Published Every Friday.

CONDUCTED BY

S. WRIGHT DUNNING AND M. N. FORNEY.

CONTENTS.

ILLUSTRATIONS:	Page.	GENERAL RAILROAD NEWS:	Page.
Locomotive Diagrams —	Old and New Roads.....	24	
Centre of Gravity	14	ANNUAL REPORTS:	
Fast Express Locomotive, with Wootten Fire-Box 16, 17	New Haven & Northampton.....	26	
CONTRIBUTIONS:	Wabash, St. Louis & Pacific.....	27	
The Control of Reading.....	Long Island.....	27	
The Diameter of Locomotive Boiler Tubes.....	Northeastern (S. C.).....	27	
The Best Position for the Centre of Gravity of Locomotives.....	Boston & Lowell.....	27	
Track Work for the Season.....	Pittsburgh, Titusville & Buffalo.....	27	
Calculating Quantities in Earth Work.....	Cleveland, Columbus, Cincinnati & Indianapolis.....	28	
EDITORIALS:	Pittsburgh & Lake Erie.....	28	
Wootten's Fast Express Locomotive.....	New York State Railroads.....	28	
The Growth of Western Traffic.....	MISCELLANEOUS:		
Record of New Railroad Construction.....	The Telegraph Combination.....	15	
EDITORIAL NOTES.....	The Pullman Suit Against the Baltimore & Ohio.....	17	
GENERAL RAILROAD NEWS:	The Central, Vermont and Northern War.....	17	
Meetings and Announcements.....	The Massachusetts Commissioners on Railroad Regulation.....	17	
Elections and Appointments.....	The Metric System Again.....	18	
Personal.....	Chicago Shipments Under the Pool.....	19	
Traffic and Earnings.....	The Massachusetts Railroad Commission on the Fall River Boiler Explosion.....	19	
Railroad Law.....		24	
The Scrap Heap.....		19, 24	

EDITORIAL ANNOUNCEMENTS.

Passes.—All persons connected with this paper are forbidden to ask for passes under any circumstances, and we will be thankful to have any act of the kind reported to this office.

Addresses.—Business letters should be addressed and drafts made payable to THE RAILROAD GAZETTE. Communications for the attention of the Editors should be addressed to THE RAILROAD GAZETTE.

Advertisements.—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. We give in our editorial columns OUR OWN OPINIONS, and those only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.

Contributions.—Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies, the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and in their management, particulars as to the business of railroads, and suggestions as to its improvement. Discussions of subjects pertaining to ALL DEPARTMENTS of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.

WOOTTEN'S FAST EXPRESS LOCOMOTIVE.

Many of our readers will be very much interested in the engravings published last week and in this number, which show the construction of the fast and heavy express locomotives now used on the Bound Brook line of the Reading Railroad. These are the heaviest locomotives ever built in this country for fast passenger service, and some idea may be formed of the rapid increase in the size and capacity of such engines, if we compare their weight, 96,200 lbs., with that of the standard 16×24 in. cylinder engines of ten or fifteen years ago, which weighed rather less than two-thirds as much. The weight on the driving-wheels of the older engines was a little more than 10,000 lbs. per wheel, that on Mr. Wootten's locomotives is over 16,000 lbs. per wheel.

The novel feature about them, though, is the construction of the fire-box, which is shown very clearly in the sectional and end views given in this number. It must be kept in mind, though, that this form of fire-box was originally designed for burning the fine waste coal from the anthracite mines. To what extent this is done in freight engines we are unable to say, but on the passenger engines ordinary merchantable anthracite coal is used.

The reason for providing a larger grate for anthracite than is needed for bituminous coal is that the former burns much more slowly than the latter. This is due to the much larger amount of volatile matter in bituminous coal and of fixed carbon in anthracite.

The following data, given by Professor Johnson in his report on coals, will show this:

	Volatile matter.	Fixed carbon.
	Per cent.	Per cent.
Anthracites.....	3.97	88.54
Free-burning bituminous.....	15.11	73.21
Bituminous caking coal.....	29.43	58.20

The volatile matter of the bituminous coals is given off in the form of hydro-carbon gases at comparatively low temperatures. At the same time, such coal swells considerably in coking, thus facilitating the access of air, which effects the combustion of both the gases given off above the fuel and the solid carbon which remains. The difference in the character of the two kinds of coals in this respect, is shown by the ease with which a fire can be made of bituminous coal, in an ordinary grate, and the difficulty of kindling one of anthracite coal.

There are no data that we know of which show from actual experiment the rate of combustion of the two kinds of coals under the same conditions. A report, made in 1878 to the Engineer in Chief of the Bureau of Steam Engineering of the United States Navy, by a board of engineers, on the qualities of various kinds of coals, contains some data relating to this question. In the report of the experiments it is said that "the rate of combustion was as great as the experimental conditions permitted." It is also stated, though, that "no comparison can be made between the different coals as regards their rapidity of burning, because the experiments in them, not being simultaneous, were differently affected, and to a very great degree, by the different atmospheric conditions." Nevertheless, they give some idea of the relative rate at which the different kinds of coal could be burned under the experimental conditions which were then employed. These rates were as follows:

	Kind of Coal.			
	West Va.	West Va.	Semi-bituminous.	Anthracite.
Pounds of coal burned per hour, per square foot of grate surface.....	21.21	14.36	13.98	12.95
Pounds of water evaporated per pound of coal, from 212 degrees Fahrenheit and under the atmospheric pressure.....	7.58	10.13	9.69	9.90
Pounds of water vaporized per pound of the gasifiable portion of the coal, from 212 degrees Fahrenheit and under the atmospheric pressure.....	8.00	10.82	11.05	11.84

That is, under the conditions given, 8 per cent. more semi-bituminous, 10.8 more bituminous and 63.7 per cent. more splint than anthracite coal was burned. The experiments were made with an ordinary chimney draft, and very little idea can be formed of what the relative rate of combustion would be under the powerful stimulant of a blast pipe in a locomotive boiler. At the rate of combustion of 58 lbs. of anthracite coal per minute, which was given last week as the consumption of Mr. Wootten's engine, "when doing full work," it would burn nearly 42 lbs. per square foot of grate per hour, and we know that locomotives often consume bituminous coal at a rate of over a hundred pounds per square foot per hour. A series of experiments to determine the rate at which the various kinds of coal can be burned would have very great value, and would be a guide in proportioning the size of fire-box to the fuel used. Some day, perhaps, railroad companies will wake up to the fact that although there may be bliss in ignorance, there is not as much money in it as there is in knowledge, and then — well, we will not anticipate the millennium. Meanwhile we will be obliged to guess at things as best we may. Colburn says that locomotives burn from 50 to 150 pounds of bituminous coal per square foot of grate surface per hour. Haswell gives the maximum rate at 120 pounds. Probably, the rate at which Mr. Wootten's engine consumes coal, "when doing full work," is not its maximum rate, so that our data are not definite enough to enable us to draw any reliable deductions, excepting that a very considerably larger grate is required to burn anthracite than is needed for bituminous coal.

Reference has been made in these columns to experiments made with a Wootten fire-box on the Camden & Atlantic Railroad by Mr. Rufus Hill, Master Mechanic of that line, to determine the best proportions of grate area for burning bituminous coal. Experimental runs were made from Camden to Atlantic City, a distance of 58.59 miles, and return. The experiments, Mr. Hill reports, were made "without any effort on the part of the engineer or fireman to economize in the use of steam or fuel—a mere natural run without any instructions to do any different from everyday practice." In both cases the trains consisted of four cars to Atlantic City and five cars back. On one trip the engine was run with the entire grate open. It then consumed 5,495 lbs. of coal.

The grate was then covered with fire-brick at the

*The engine was a good deal lighter than the one illustrated in this number of the Railroad Gazette.

front end, back of the bridge-wall, for a distance of 31 in., and the entire width of the fire-box, so that one-third of the grate was covered and two-thirds open. Under these conditions and with the same train the engine burned 4,900 lbs. in making the round trip. Under the latter conditions Mr. Hill reported:

"Perfect combustion seemed to be obtained; no sparks left the furnace, or, in other words, no sparks were drawn through the flues; only the very light products resembling ash were distinguishable. No smoke was observable; a slight discoloration only was visible when firing hard, and when the fire was broken up with a slash bar. The engine steamed up to the blowing-off point continually. No one would know that the engine used soft coal unless the fact was pointed out to them."

With the grate entirely open, as it was on the first run, there was "an increase of smoke, and the cinders were noticeable. Attention was called to this, by the train-hands, but there was not enough smoke or cinders to be annoying."

The experiments indicate that, with light trains, the grate was larger than is economical for burning bituminous coal. What the result would have been with heavy trains it is, perhaps, impossible to tell without further experiments. It does not follow, though, that the fire-box is too large, even if it has been proved that there is more grate area than is economical. Although Clark's maxim that "there may be too much grate area for economical evaporation, but there cannot be too little, so long as the required rate of combustion per square foot does not exceed the limits imposed by physical conditions," may be true, it may nevertheless be desirable to have the fire-box as large as possible. What appears to be needed in burning bituminous coal is to bring the air and fuel into as intimate contact as possible on the grate, and then to give them as much room to mix above it as possible. Two streams of water, a muddy and a clear one, will flow alongside of each other in the same channel for a long distance without mingling, but if they empty into a lake or pond they will soon mix. A similar action occurs above the fire on a grate, if there is room enough there for partial quiescence. The gases and air will then soon mix and perfect combustion will take place. What appears to be needed is, first, a grate not larger than is needed to burn the requisite quantity of coal to do the work, and then as much room above it in the fire-box as possible.

The facilities which Mr. Wootten's form of fire-box gives for making a thorough series of experiments to determine the most economical size of grate for the different kinds of fuel have been pointed out in these pages before.

In an article on "Passenger Engines," published in the *Railroad Gazette* three weeks ago, the following conclusions were drawn:

"What is needed for a fast passenger engine with trains of 15 or 16 cars is:

"First, a fire-box about three times as large as those used on the old 16×24 in. cylinder engines.

"Second, as large a barrel of boiler as possible and tubes somewhat larger in diameter than usual.

"Third, as much weight on each of four driving-wheels as will be permitted on the rails.

"Fourth, five cubic inches of cylinder capacity per inch of circumference of driving-wheels per ton (of 2,000 lbs.) on the wheels.

"Fifth, the stroke of pistons should be 30 per cent. of the diameter of driving-wheels."

Let us see how nearly Mr. Wootten's engines fulfill these conditions.

The old 16×24 in. cylinder engines had about 15 square feet of grate area. The proposed engines, by the above rule, would require 45. This proportion was based on the supposition that bituminous coal would be burned. Mr. Wootten's engine has 76 square feet, which may not be too large for anthracite, but probably is greater than is needed for bituminous coal.

The barrel of the boiler is 58 1/4 in. in diameter, and could be made larger on an engine of this design, but this, of course, would increase its weight. According to the calculations of three weeks ago it should be 79 1/4 in. diameter. It is, though, impossible to have it of that size, and therefore it must be made as large as the limits of weight and space will permit.

The proportion which the weight on the driving-wheels or adhesive weight should bear to the loads hauled was not discussed in the article referred to, but was merely mentioned. It is evident, though, that to attain the same speed, in the same time and distance, the adhesive weight should be proportionate to the loads to be hauled. That is, to get up a speed of 30 miles per hour, with a train weighing 375 tons, requires 50 per cent. more adhesive weight than is needed to attain the same speed with a train of 250 tons. Of course, to get up a speed of 45 miles per hour with a train of 375 tons, in the same time required to run 30 miles per hour with 250 tons of load, would make a much more than proportionate amount of adhesion necessary.

Assuming then the same hypothetical weights and speeds for trains and engines that were given in the article referred to, we find that the locomotive illus-

trated this week and last has a weight on the driving-wheels somewhat more than 50 per cent. greater than that of the old 30-ton engines. The more adhesive weight there is, though, the quicker can a high speed be attained. As there is room for a larger boiler in an engine of this design, and as an increase of capacity would be desirable, it becomes simply a question of the ability of the track to resist or carry greater weights. If it can, the engine would be more efficient if the barrel of the boiler was increased in diameter.

The cylinder capacity of Mr. Wootten's engine is about 4.45 cubic inches per inch of circumference of driving-wheels per ton of adhesive weight, instead of 5 cubic inches. It seems probable that a somewhat larger cylinder might be desirable.

The stroke of pistons is 32.35 per cent. of the diameter of the wheels, instead of 30, as proposed.

The distance from centre to centre of driving-wheels is seven feet, so that the coupling-rods are comparatively short—a matter of some importance in locomotives to run at a high speed.

Altogether, though, the engines fulfill more nearly the conditions which were deduced from merely theoretical considerations than any which have thus far been built in this country for running fast and heavy trains. It need not be surprising, then, that they are doing their work in a very satisfactory way.

The great height of the boiler, though, may by some be regarded as the most serious objection to these locomotives. The distance from top of rail to centre of boiler is 92 in. From 70 to 72 in. is the ordinary height. As this view of the subject is very fully discussed on another page, in Mr. F. C. Wootten's thesis, it will not be taken up here, excepting to say that it is doubtful whether a man blindfolded could tell whether he was riding on an engine with the boiler 72 or 92 in. high. The height of the boiler of the engine having a single pair of 6 ft. 6 in. wheels, built at the Baldwin Locomotive Works last year, and illustrated in our issues of May 7 and June 11, was 88 in., so that Mr. Wootten's is only 4 in. higher.

THE GROWTH OF WESTERN TRAFFIC.

The returns of receipts of leading staples of traffic of some of the principal Western cities have been made, from which we take the following for Chicago :

1880.		1879.		Inc. or Dec.		P. c.	
Flour, bbls.	3,377,313	3,369,958	I.	7,355	0.2		
Wheat, bush.	23,313,560	34,106,100	D.	10,792,549	31.6		
Corn,	5,846,145	6,339,321	I.	31,506,824	49.0		
Oats,	21,852,073	16,660,428	I.	5,191,645	31.4		
Rye,	1,841,142	2,497,340	D.	650,198	26.3		
Barley,	5,274,428	4,936,563	I.	337,866	6.8		

Flour and grain,		bush.		1860, 013,913		1879, 388,550		25,624,363		18.4	
bush.		100 lbs.		1,459,073		1,697,725		I.		44.8	
Hog products,											
:100 lbs.	2,338,127	2,268,861	I.	69,266	3.1						
Butter, 100 lbs.	676,358	546,232	I.	130,126	24.0						
Live hogs, No.	7,066,144	6,448,300	I.	617,844	9.6						
Cattle, No.	1,382,346	1,215,732	I.	166,614	13.7						
Lumber, M.	1,556,134	1,469,879	I.	86,255	6.0						
Shingles, M.	652,547	670,644	D.	18,097	2.7						

Although there is an increase of 18.4 per cent. in the total grain receipts, there was a falling off of no less than 31.6 per cent. in the wheat receipts, which was doubtless due to the fact that an exceptionally large proportion of the great wheat crop of the year was in a part of the country too far south and east to ship to advantage by way of Chicago. The corn receipts increased no less than 49 per cent., and were, in 1880, 58 per cent. of the total grain receipts, against 21.3 per cent. in 1879.

The statement for St. Louis is as follows :

1880.		1879.		Inc. or Dec.		P. c.	
Flour, bbls.	1,612,627	1,607,236	I.	5,391	0.3		
Wheat, bush.	18,439,403	17,093,362	I.	1,346,041	7.9		
Corn,	21,227,157	13,360,638	I.	7,866,521	58.9		
Oats,	5,197,025	5,002,165	I.	124,913	2.5		
Rye and Barley, bush.	2,903,440	2,544,235	I.	359,205	14.1		

Flour and grain, bush.		55,760,213		46,030,578		I.		9,723,635		21.1	
Cotton, bales....		496,570		335,706		I.		160,774		48.0	
Hogs, No.	1,839,684	1,772,724	I.	76,960	4.4						
Cattle, No.	494,720	420,654	I.	4,066	1.0						

*Year ending Aug. 31.

St. Louis thus has an increase of 21.1 per cent. in grain, against 18.4 at Chicago; but in amount the increase at St. Louis is about three-eighths as great as that at Chicago. It approaches Chicago most nearly in wheat receipts, the latter city having one-fourth more this year, while it had twice as much last year. St. Louis, however, is situated just where wheat production has increased most of late years, and its increase over 1879 is not very large. Chicago this year received more than four times as much corn and oats as St. Louis, nearly four times as many hogs, and more than three times as many cattle. Its increase in cattle and hogs was a much greater percentage than the increase at St. Louis.

Milwaukee reports the following receipts :

1880.		1879.		Inc. or Dec.		P. c.	
Flour, bbls.	2,392,002	2,300,673	I.	6,721	2.8		
Wheat, bush.	10,010,104	19,040,352	D.	8,739,358	44.4		
Corn,	2,110,865	1,908,634	I.	70,221	54.8		
Oats,	2,000,640	1,705,026	I.	301,584	17.7		
Rye,	770,963	666,124	D.	76,101	8.5		
Barley,	3,256,741	3,080,759	D.	637,018	10.8		

Flour and grain, bush.		31,020,030		30,474,380		D.		8,444,327		21.4	
Hogs, No.		697,513		690,327		I.		6,080		1.1	

An overwhelmingly large proportion of Milwaukee's receipts consists of wheat and flour, which the partial failure of the wheat crop in 1879 reduced very greatly in 1880, so that its total grain receipts fell off 21.4 per cent., against an increase of 18.4 per cent. at Chicago, and of 21.1 per cent. at St. Louis. The aggregate decrease in wheat receipts at Chicago and Milwaukee was 19,522,000 bushels, against which there was an increase of but 1,346,000 bushels at St. Louis. Milwaukee's lumber business, not reported above, is important, but the city seems to be becoming more important as a manufacturing than as a commercial city. The figures for ten successive years show its flour, wheat and other grain receipts to have been as follows :

Year.	Wheat.	Flour and Wheat.	Other grains.	Total.
1871.	15,686,611	19,670,521	3,609,619	23,280,140
1872.	13,618,959	17,789,969	5,605,368	23,395,337
1873.	28,457,937	34,732,042	4,109,628	38,841,670
1874.	25,268,143	33,349,833	4,445,579	37,795,512
1875.	27,878,727	35,097,732	4,299,287	39,397,018
1876.	18,174,817	28,588,257	4,928,809	33,517,068
1877.	19,303,709	25,800,809	5,217,079	34,017,888
1878.	21,401,953	32,718,468	6,450,743	39,169,256
1879.	16,649,352	30,447,837	9,036,449	39,474,286
1880.	10,919,994	22,884,754	8,145,205	31,020,959

Thus, in spite of a considerable increase in "other grains," Milwaukee has had but once any increase over its total grain receipts in 1875, and that but trifling, and in 1880 its receipts were much smaller than in any other year since 1872. The increase in "other grains" is largely in barley, the brewing business at Milwaukee being great and growing. The decrease in wheat, which is very decided, is doubtless due largely to the abandonment of wheat cultivation in Wisconsin for something more profitable, and Milwaukee has a large business in supplying the lumber regions and the Lake Superior mining country with corn, oats and other provisions, while the larger wheat country further west, in Minnesota and Dakota, markets its grain at Milwaukee less than formerly. In wheat, when its receipts culminated as long ago as 1873, when they were nearly three times as great as last year, and when in wheat and flour together they were one-half more.

Chicago grain receipts for ten years have been :

Year.	Flour, bbls.	Wheat, bush.	Corn, bush.	Flour, bush.
1871.	1,412,077	14,439,656	41,853,138	84,223,701
1872.	1,532,014	12,734,141	47,306,087	89,192,849
1873.	7,487,376	26,296,562	38,157,232	160,189,101
1874.	2,666,679	29,764,622	33,799,638	96,045,053
1875.	2,625,883	24,206,370	28,341,150	82,000,243
1876.	2,955,197	16,574,058	48,668,640	99,213,081
1877.	2,601,142	14,164,515	47,915,729	95,781,970
1878.	3,030,562	29,713,577		

The Massachusetts Commissioners on Railroad Regulation.

The following letter from the Massachusetts Railroad Commissioners in reply to the communication of the New York Chamber of Commerce Special Committee of Transportation (the same that Judge Black's letter responded to) has been published:

GENTLEMEN: Your interesting communication of August, 1890, with accompanying questions and exhibits, has been received and considered with the care which the importance of the subject demands. We take pleasure in replying as individuals. Officially we cannot act, as the state has not commissioned us to do so, and you will understand that we speak for ourselves and not for Massachusetts. We need not apologize, because we shall refer so often to the statutes, decisions and practice of our own state. We understand that you desire from each correspondent such information as lies more especially within his reach.

There is no doubt that railroads should treat all shippers with equality under like circumstances, and with relative equality where circumstances differ. And discriminations against individuals and communities should be prevented by each state passing laws forbidding such discrimination under heavy penalties. Such laws will be better enforced if a Railroad Commission exists in each state, which, among other duties, will investigate charges of discrimination, bring public opinion to bear upon offending corporations, and, if need be, direct prosecutions in the courts of law. It is not consistent with public welfare and the rights of citizens to allow railroad managers to decide what persons shall be favored, and what places developed by discriminating rates. The legislature never intended to place this enormous power in the hands of its corporations. It may be doubted whether any legislature has the constitutional right to delegate such power. This question of preference for places and persons was decided in England in a series of cases by the late Chief Justice Cockburn, at a time when the working of the railway law was intrusted to the Common Pleas Court. Lord Cockburn was a jurist who, when unaffected by passion or partisanship, was superior to any living judge in England. And decisions in favor of the people and against corporations which are good law in England certainly ought to be sound law here.

The principle that railroad companies are public corporations is fully established in this state. And they have always been subjected to government control in the interest of the public. The Supreme Court say: "The conferring upon the railroad corporations the power of carrying freight and passengers has imposed upon them, to some extent, the correlative duty of carrying them at reasonable times and for a reasonable compensation, subject to the revision of the Legislature. * * * The construction of a railroad is not a private enterprise. The corporation exercises the right, or the Legislature through the corporation exercises the right to take private property for the road on the ground that the use is a public use, and the road itself a highway for public travel. On no other ground could the exercise of the right of eminent domain by or through these corporations be upheld.

HOW IT WORKS IN ENGLAND.

The English system of regulation by railway commissioners works excellently. The best proof of this is the fact that now few complaints are made before it. The existence of such a tribunal and the knowledge of its powers, remove the causes of complaint. It makes justice prompt and cheap, and brings it near to the people and to business men; and it is found that such a commission is better fitted than the courts of law to deal with questions that arise between shippers and railways, or between different companies. Every state should, in our opinion, have a tribunal of this kind; and if it is impossible in any state of this Union that such a commission should do its work, because of the extent of the evil to be remedied, or because of the aggregate wealth opposed to the redress of abuses, this shows that in that state good government has become impossible, and that self-government there is a failure. We cannot believe that this is true of any state.

We do not believe that a fixed limit can be placed in advance on the charges of railroads. The circumstances of each differ; and the rule which would be right in one case, would do injustice in another. With such a tribunal as has been spoken of, with full power to examine all contracts and all the doings of corporations—always easy of access by the people, and ready to investigate thoroughly every complaint, justice can speedily be had. The recommendation of the board will generally be heeded by the railroad companies. Or, if it is not, it will be heard by the Legislature, to which those companies are amenable. The rule laid down by the law is that charges must be reasonable; and this rule should be adhered to. The form of your question assumes that "railroad managers" adopt the new rule of charging all that the traffic will bear. Perhaps it would be more just to say this of some managers. It certainly is not the rule of law.

A FIXED RULE NOT DESIRABLE.

The peculiar circumstances of the legislation fixing the maximum for passenger rates on the New York Central make it an exception. A fixed rate per mile applied in advance to all freight charges would work hardship, injustice and inequality. Freight can be hauled more cheaply over a long route than over a short one. Charges should be lower on a road doing a large business than on a road doing a small business. Grades, costly bridges, and expensive terminals are to be considered in fixing rates. Equality in rates would often produce inequality in results. The limitation of profits to 10 per cent, seems to be just in principle, but has hitherto succeeded only in taxing the ingenuity of railroad men to devise means for evading it. Cases can be imagined where it would be unwise in policy. Wherever the principle is adopted, it ought not to be evaded by any false basis of cost or any form of watering. If the surplus earnings were rightly earned and legally expended in making needed improvements at honest prices, there is no reason why dividends should not be paid on the cost of those improvements. If those earnings had been paid to stockholders in the form of dividends, and reinvested by them in new subscriptions for stock, no one would doubt this. The principle is not different when they are directly invested in improvements really adding to the value of the road, and the convenience and safety of public travel. If there was evasion of any law in keeping these earnings, that was the original sin which it would be hard to reach now. If surplus earnings were gained by unreasonable rates demanded and received, it certainly is too late to remedy this permitted wrong. There is no difference of opinion among honest men as to the watering of stock by any device by which a fictitious basis of value is established. It is forbidden under heavy penalties in this state.

Answering the questions as to the legislation to secure reasonable and equal rates for freight and passengers, we have spoken only of state legislation. And we consider the appointment of railroad commissioners as the most practical measure needed for the enforcement of the rights of the people. As has been remarked before, principles of law that had long been settled seem to have been regarded as

open questions by leading railroad managers. It has been considered by them as hazardous to adopt by legislation rules of the common law which had been fixed for centuries, and which have long since been applied to railroads in this country. The chief need has been a tribunal easy of access, inexpensive to the party wronged, and not encumbered by the machinery of legal forms.

OPPOSED TO NATIONAL LEGISLATION.

The matter of national legislation is a graver one. It is not so much a constitutional question as one of policy as to the use of constitutional powers. Certainly evils exist which it is hard to remedy by state legislation. But greater evils may be incurred by calling for national legislation. If it is once begun to be exercised, such legislation would affect not only roads running from state to state, but all roads connecting with such routes, so that the smallest branch in the obscurest hamlet would have a portion of its business controlled by the central power of our government. It would be a strain on a government like ours to have the direction of \$5,000,000,000 worth of property placed in its hands. It is said that four companies, and indeed four men, now control a vast proportion of the transportation business of this country. Is it not possible that their influence might still control it if it were directed by Congress? And would it not be easier to control it through one legislative body than through many?

The danger of combinations between different states and sections is so obvious that it hardly needs to be mentioned. The regulation of freight charges could easily be managed, so as to cut off certain ports and states from all export trade. A favorite project, for instance, is a fixed rate per mile for each ton of Western grain carried east. This would render it impossible to ship grain from certain Eastern ports. Is there not a possibility of legislation of this kind? There would also be danger that in exciting times politics might sway the action of Congress. It is plain, that the business of one part or one whole section might be increased as a mark of favor, or starved as a penalty. There have been periods in the history of this country when a direct power to do this would have been exercised. No one can warrant us against a recurrence of such times and such feelings. The general effect of such an exercise of power upon the character of our government is a serious question. No other scheme ever discussed has proposed such a consolidation of power as this. A change in forms of infinitely less consequence would excite universal indignation among the people. If the control of \$5,000,000,000 were given to Congress, including the direction of untold millions worth of freight each year, our government would cease to be what it now is. We have barely indicated the peril that would attend such an assumption of power; and these perils begin to be incurred when Congress begins in any way to control the inter-state railroad traffic. It would be well, at least, to exhaust state legislation, and to attempt in all ways concurrent state legislation before taking the "heroic" and almost desperate remedy of subjection to national legislation. Even a National Railroad Commission would be dangerous, as implying a power of controlling transportation throughout the states, and as opening a way for further aggression on state rights, unless its power were carefully limited to the hearing of facts and the collection of information.

THE RIGHT OF RAILROADS TO COMBINE.

One word should be said of the supposed need of national legislation to promote what has been called the "federation of railroads." That system has been most ably advocated, and is now supported by the great names of C. F. Adams, Jr., and Albert Fink, and no higher authority on railroad questions could be given. But those who believe that the solution of our railroad problem is to be found in federation need not resort to national legislation, although Mr. Fink's language seems to imply that it is necessary. The railroad companies have full powers now to contract with each other, subjecting themselves to rules and to the decisions of arbitrators for any term of years; and those contracts will be enforced by the courts. It does not need that the federal government "legalize," still less that by a stretch of its powers it should "incorporate" organizations formed by railroad companies. Such self-government can be established without the authority of the United States. It needs no exercise of the law-giving power anywhere. If it be said that states will forbid such combinations, the answer is that the public opinion which could procure the passage of a national law permitting federation would certainly prevent the states from forbidding it, and that even the courts, upon a question of public policy, are liable to be affected by public opinion. If it is thought that the officers of such organizations can enforce their own decrees without the intervention of courts, the answer is, that in this country it is impossible. Ultimately, with or without legislation, the final resort in case of difference of opinion or resistance to a decision must be to a court of law. But with or without legislation, the best strength of such a system is found in the fact that its commissioners and arbitrators are men of such intelligence and such character that their decisions need no tribunal to execute them. Such is the case at present, and no legislation could add force to the decisions of the tribunals voluntarily established by the railroad companies.

This reference to a supposed method of escaping many evils of our present system seemed necessary in order to a general view of the subject. We will only add that the sending of this reply has been delayed, in order to obtain the concurrence of a member of the board absent on official business. The letter of Judge Black has been made public in the meantime. But we have not thought it necessary to strike out that portion of our communication which has been anticipated by him. Very respectfully,

THOMAS RUSSELL,
ALBERT D. BRIGGS,
EDWARD W. KINSLEY.

The Metric System Again.

In our issue of Dec. 24 we copied a communication on this subject signed "F. B.," which was a reply to Mr. Seller's paper, and originally appeared in *Engineering News*. A writer in the *Boston Journal of Commerce* answers back. The following extracts are from the latter article:

In commenting on Mr. Seller's paper "F. B." says "he mentions seven scales which he says emphatically are the only ones we can use for metrical drawings, and complains that these are not enough." Then, quoting Mr. Seller's assertion that "the jump from one-half to one-fifth size is unfortunate. If we could conveniently the italics are our own) quarter the whole size, we would have an increased area section, a matter of much moment." He continues: "Then, why in the name of reason should we not do so. We can use a scale of 25 per cent, of full size, as conveniently as we can use a 25 cent piece or a 2½ dollar piece in federal money. Does not Mr. Seller know that our currency is decimal? Well, take what he does know: The metric system is nothing if not decimal: and the graduations of any metric scale, which on one drawing represent certain dimensions, on another drawing per-

fectly represent ten times those dimensions." Then he goes on to prove (in his position by using one of the seven scales mentioned by Mr. Seller, and, by continual doubling, presents a series of scales, having the peculiar merit that each is twice as large as the next one, which he intimates is what Mr. Seller deems essential. The scales he thus builds up are:

.025 .05 .1 .2 .4 .8.

These tests in vulgar fractions are:

$\frac{1}{40}$ $\frac{1}{20}$ $\frac{1}{10}$ $\frac{1}{5}$ $\frac{1}{2}$ $\frac{1}{1}$

Drawings made to constructed scales such as "F. B." suggests can only be conveniently read by means of the rule used in construction. The metric rule of commerce is divided into centimeters by long marks, into half centimeters by shorter marks, into millimeters by still shorter marks of uniform length, and the finer rules used by engineers have these millimeter spaces cut up into five parts each. Thus the whole scale presents the smallest divisions in groups of five. Mr. Seller gave the five scales used in metric countries, all of which can be read from any well divided metric rule as compared with the many scales which can be read from a well divided inch rule as used here. A metric rule constructed as usual down to the millimeter division, and these minor spaces subdivided into four equal parts, will give a rule capable of reading a drawing made quarter size, because each of the five divisions will stand for one whole millimeter of the reduced scale. This, however, means a departure from the rule in its perfect simplicity. German draughtsmen use the fifth scale because they or any one else can read the drawing with comfort by means of the rule of commerce.

It may be said that Mr. Seller holds that several of the seven scales he names must be constructed, then why not construct all? The construction of these small scales is, we understand, for convenience, and is not a necessity. Every one of the scales mentioned by him, with, perhaps, the single exception of the one-twenty-fifth size, can be read in the rough, for the purposes for which such small scales are used, from any well divided metric rule. The one-twenty-fifth scale reads four millimeters to one decimeter; it is not easy to read consecutive groups of four on a rule divided into groups of ten by long marks, and into groups of five by shorter ones. Let any one who does not already know this try the experiment. We think he will see the force of our remarks, and prefer a constructed scale divided into groups of four, or rather having spaces clearly marked as units, each of these units being equal in length to four millimeters, and these units thus subdivided into ten each. It is a rule thus constructed that "F. B." submits as an answer to Mr. Seller's objection to the metric scale at the drawing board. Mechanical drawings during their process of construction present no figured dimensions for guidance. The figuring on the drawing is the last operation, after it has been inked in. Until it is figured it is readable only by means of a scale of proportions. Most shops insist that their drawings shall be made to scales readable by means of the two-foot rule, when on the inch scale, and by the metric rule pure and simple, the drawing is made to millimeters. A drawing made to the largest of the scales proposed by "F. B.," viz., the four-fifth size (we hope he will pardon us for reducing his noble decimals to vulgar fractions), has some dimensions that read on an ordinary millimeter rule say 354mm. How are we to know what this stands for in the full-sized machine? Why we have only to divide the dimensions so read by 0.8, or to multiply it by five and then divide the result by four. By either process we obtain 442.5; now, as we know half millimeters are not in any ordinary set of shop sizes, we infer that the space measured stands for either 442 or for 443. As for any man being able to judge of how a piece drawn to $\frac{1}{5}$ scale will look full size, we are inclined to be sceptical. We do know that it is within the limits of ordinary minds to double, halve, or to quarter, we may say even to treat as thirds, either up or down, a scaled drawing, with a fair assurance of his being able to feel in his consciousness the true size or dimension of every part, but we doubt the ability to so increase or diminish by $\frac{1}{2}$ by $\frac{1}{4}$, etc., without translating into full size in figures and then thinking what those figures mean. One of the great advantages of a rule sub-divided by a process of continual bi-section is that it gives to the draughtsman the radius of all the diametrical distances with such perfect ease and certainty. The radius of 400mm. is 200; this is simple enough, but the radius of a circle, 399mm. diameter, is 199.5, requiring the half millimeter on the scale the drawing is being made to, for the ready spacing of the dividers.

"F. B." says, in reference to Mr. Seller's treatment of the metric system in the drawing room, "the subject of draughting and computing, however, he so befores that a few simple words are in order." What we have given is the gist of these simple words, but they do not, to our mind, seem to come from one so familiar with the draughtsman's needs as does what Mr. Seller has given us to think about. "F. B." says, too, "that it is audacious for any one to say that the advantage of the inch series admits of no dispute." We would like to elaborate this very matter of the advantages of the inch series, because we think Mr. Seller, doubtless fearing to make his paper too long, has done only scant justice to its merits. "F. B." continues: "About computation, Mr. Seller's remarks are still less adequate, though not so audacious." We sympathize with Mr. Seller in the risk he runs in touching on that dangerous ground. If the metric system has any merit, it must lie in its value in facilitating all kinds of computations. In fact, we were, before reading Mr. Seller's paper, quite ready to confess judgment and let that case go by default. What "F. B." says in regard to the arithmetic of the machine shop, however, does not affect what Mr. Seller says. He does not show how calculations involving many figures can be made in shorter time than ones involving few figures. As the unit of the machine shop has, by common consent in metric countries, been fixed by the adoption of the millimeter, as the unit, and as more figures are involved in the designation of sizes by millimeters than is their average in inches and fractions, it seems but reasonable that the metric system cannot shorten the processes of addition, multiplication and of division. It is as if we were to abandon our inch and its division into sixteenths, and were to take the sixteenths of an inch only, and call it our unit, and then, in place of three or four inches, we should say 48 or 84. This has been done sometimes when formulating matters below the inch size, but does not present advantages in dealing with long measures.

The merit of a system cannot be proved or disproved by one or two examples in arithmetical calculations. "F. B." says it is not fair to compare the multiplication of 1.5m. \times 1.5m. \times 3m. with 5 ft. \times 5 ft. \times 10 ft., but says "for real comparison with what is now in use, let him take 1' 5" \times 1' 5" \times 3', and see whether his carpenter will reckon it in his head." Had Mr. Seller taken the example given by "F. B.," he would then have compared it with 432mm. \times 332mm. \times 915mm., or with the same numbers in the decimals of the meter. Mr. Seller used the examples in illustration of conversion of bulk into weight. It is unfortunate that he did not hit upon the combination suggested by "F. B." as it would have done him a good turn. We do not know very much about carpenters and their ability to calculate, but nevertheless the

many calls upon their ingenuity in the construction of buildings, often without any drawing to guide them, has led us to consider them rather above the average of mechanics in their readiness with figures. How the knowledge of the well, we will say, average carpenter—will enable him to tackle this problem, will depend on his ability to multiply 17 by 17 in his head. If he has not learned the multiplication table up to 30 times 30, he can at least multiply 17 by 7 and hold the picture of the result, 119, in his head long enough for him to place the 17 under the 11 of the 119, and then add up this easy sum. The result, 289, will look so like twice 144, viz., 288, that he would most likely call the result two square feet, and finish this difficult problem with 3 by 3 feet equals 6 cubic feet. A draughtsman might do it more readily, because his two-foot rule is graduated on its edge to the decimals of a foot. And 17 inches reads 1.416, and this looks so like a certain quantity he never forgets, if he has had experience in drawing, that 17 by 17, to him, stands as 3 square feet. If "F. B." wants to know why the expression 1.416 looks so familiar, it is because it comes so close to 1.414+, which is the square root of two, and is therefore the ratio of the diagonal of a square to its sides. In the process of grinding into his mind all the things worth remembering, he fixes the fact that a square of two anything area has a side 1.414+. All of these examples amount to nothing, however, in the way of argument. Mr. Sellers' experience has shown him, he says, no gain, the loss from the use of a small unit, requiring many figures to express what is needed, taking away from the other advantages of the system when considered from a labor-saving point of view. Here is a plain statement of what he seems to consider a fact. If he is wrong, any one can satisfy himself in the way he has done: that is, use both for twenty years or so and then give us his experience.

The Massachusetts Railroad Commission on the Fall River Boiler Explosion.

We give below the report of the Massachusetts Railroad Commission on the explosion of a locomotive boiler on the Fall River Railroad on Nov. 3 last. In our issue of Dec. 31 a paragraph, copied from a Boston paper, appeared, which gave a very incorrect idea of this report. The full text of the document is as follows:

The witnesses in this case were examined immediately after the accident, but a decision has been delayed until the boiler could be personally examined by the Commissioners and by experts employed by them. This locomotive, the "Jupiter," was built at the Mason Locomotive Works at Taunton, in 1859; a new fire-box was constructed in 1871, it was "thoroughly repaired and overhauled" in March, 1879. Nothing was done at that time to the boiler, because it was supposed that nothing needed to be done.

On the morning of the accident the engine came out at 11 a. m. to start from New Bedford for Fall River at 12:15. The engineer reported to the Superintendent of Motive Power that a slight leak appeared on the wagon-top just above the foot board, and that water was slowly dropping from it. The lagging or jacket (wood work covering the boiler) was removed, and a leak one-half inch was found. The lagging was relaid, and the engine was sent out on time, without objection by the engineer, and apparently without any hesitation on the part of the Superintendent. Another locomotive was sent for to take the place of the Jupiter on the next day and during repairs. The engineer was requested to keep the steam as low as possible. The usual pressure was 110 pounds to the square inch.

The engine went safely to Fall River, but while returning with one freight, one baggage and one passenger car, when crossing Long Bridge, over Watuppa Pond, an explosion took place, tearing the boiler to pieces, demolishing the cab and breaking the connection of the cars, but not derailing any of them. The fireman was thrown on the coal and was somewhat scalded. The engineer was hurled into the water, where the body was found the next day with a fatal wound on the head and face.

The following report, made by a most skillful and trustworthy expert, shows the cause of the accident. And his views are confirmed by still another expert, and by the examinations of the Commissioners:

"OFFICE OF U. S. LOCAL INSPECTORS / OF STEAM VESSELS / BOSTON, Mass., Dec. 17, 1880. /

"The Hon. Thomas Russell, Chairman Board of Railroad Commissioners:

"Sir.—In compliance with your request of the 8th inst., I carefully examined the exploded locomotive boiler at Taunton on the 14th, and beg leave to submit the following opinion as to the cause, etc.:

"First.—The initial point of rupture was evidently on the left-hand side of the wagon top on a line just above the horizontal diameter of the boiler, through a plate once solid and 5-16 in. thick, but from wear and tear reduced in the form of crack from the inside to a very small proportion of its original thickness, and, at some points, to a mere skin on the outside. This crack extended the whole length of the wagon or fire-box part of the shell, 4-1/2 ft., and constituted a chronic weakness which was without doubt the sole cause of the accident.

"The elastic and diabolical force of the steam, acting upon this large plate, suddenly detached for 4-1/2 ft., threw it upward and tore it mostly through the line of rivet holes at each end, running over and down the flat side opposite, pulling through 51 screw-stays, and there tearing itself clear from the boiler. This piece, which formed the entire crown of the shell of the boiler, including a dome 24 in. diameter, measures about 4-1/2 by 8 ft.

"The primary cause of this old crack, in my opinion, was the deflecting and fretting effect on the plate, disturbing the fibres of the iron, with every material variation of pressure and expansion—due in this case to the arrangement of the bracing—and so the weakening process went on till the limit of endurance was reached.

"As a rational means of ascertaining that a boiler retains a margin of strength to enable it to safely withstand the strain of a given pressure, it should, at least once in every year, be subjected to a hydrostatic test of 50 per cent. beyond the every-day working steam pressure, at least. Had this been done, together with a careful, thorough and intelligent inspection, it is my opinion the weakness in this case would have been discovered and the disaster avoided.

"Very respectfully, ANDREW J. SAVAGE."

The boiler was not as strongly built as boilers are now. But the defect arose from a cause which is liable to affect all locomotive boilers, the wear and tear arising from their ordinary use. Against this danger we know no safeguard except the frequent testing of boilers by some one of the well-known and approved methods, that of cold water pressure being, in the opinion of the Board, best.

No record of any recent application of such test to this boiler appears. The proper application of such a test at any time within a year would have revealed the defect, and would have prevented the accident. Such an occurrence does not

greatly affect the public, when only employees are injured, because it does not seem to endanger them. But it hardly needs to be said that the explosion of a locomotive boiler does imperil every one upon the train, and if it occurs at a station it may destroy those who have nothing to do with the road, and who have no idea of incurring any railroad danger.

The Board will once more recommend legislative action upon the subject of locomotive boiler inspection. In the meantime, it suggests to all railroad managers the expediency of annual tests.

The action of the Superintendent of Motive Power at New Bedford is next to be considered. It seems to the Board that he was in fault in sending out a locomotive when the boiler was leaking as this did. The partial examination made by him showed that the leak was not at a seam, but through the plate. The best that can be said is that he did not know whether it was in a dangerous condition or not. And this shows that the engine ought not to have gone out.

At the same time justice compels the Board to say that this official acted as other railroad men probably would have done, and heretofore have acted in like cases. The evidence is that it is not unusual to send out locomotives with slight leaks in the boilers. The testimony shows that he acted in accordance with railroad usage. But the Board condemns that usage, and holds that no engine should be sent out on the faith that such a defect will not prove dangerous. The train in such case should wait until another engine can be obtained, or till it can be made sure that there is no danger.

By the Board. WM. A. CRAFTS, Clerk.

Chicago Shipments Under the Pool.

The following interesting circular has been issued by Mr. Fink as Chairman of the Joint Executive Committee:

Experience has proven that the maintenance of rates on east-bound freight from the Western cities to the seaboard is not secured by the present divisions of traffic between the initial Western roads, and that this object can only be attained by extending to the "trunk roads and their immediate connections" the same arrangements for divisions of traffic. At present the motive for cutting the rates by the trunk roads and their connections is just as strong as though no division between the initial Western roads existed. With a view of facilitating a division of the Chicago freight traffic between the trunk roads, there have been prepared the following statements, viz.:

Statement No. 189—Showing the proportion of the Chicago freight traffic forwarded to the East by each trunk road during the various periods from June 9, 1879, to Oct. 31, 1880.

Statement No. 189 A—Showing the proportion of the Michigan Central Railroad Company's freight traffic forwarded to the East by each road during the various periods from June 9, 1879, to Oct. 31, 1880.

Statement No. 189 shows statistics for two periods of time.

The first period covers the various months from June 9, 1879, to May 31, 1880.

The second period covers the various months from Jan. 1, 1880, to Oct. 31, 1880, during which the Chicago & Grand Trunk Railway participated in the traffic, and to some extent changed the distribution, as shown during the first period. There will be found in this statement the tonnage to each city or district in the East, and the relative importance of the traffic to said city or district expressed in percentages of the total Chicago tonnage. Also, the traffic for said city or district received from each Chicago road by each trunk road expressed in percentages of the total Chicago tonnage.

The final results of the first period, from June 9, 1879, to May 31, 1880, are as follows, viz.:

The Grand Trunk Railway (east of Toronto) carried 5.80 per cent. of the total Chicago tonnage, of which there was received:

From the Michigan Central 5.19 per cent.
From the Lake Shore 0.11 per cent.
From the Fort Wayne and Chicago & Lake Huron. 0.50 per cent.

Total 5.80 per cent.

The New York Central carried 38.83 per cent. of the total Chicago tonnage, of which there was received:

From the Michigan Central 19.14 per cent.
From the Lake Shore 19.09 per cent.

Total 38.83 per cent.

The New York, Lake Erie & Western carried 15.51 per cent. of the total Chicago tonnage, of which there was received:

From the Michigan Central 4.96 per cent.
From the Lake Shore 2.60 per cent.
From the Fort Wayne 1.31 per cent.
From the Pan-Handle and Atlantic & G. Western 6.64 per cent.

Total 15.51 per cent.

The Pennsylvania Railroad carried 26.48 per cent. of the total Chicago tonnage, of which there was received:

From the Lake Shore 3.45 per cent.
From the Fort Wayne 19.72 per cent.
From the Pan-Handle 3.31 per cent.

Total 26.48 per cent.

The Baltimore & Ohio Railroad carried 9.12 per cent. of the total Chicago tonnage, all of which was received from the Chicago Branch of the Baltimore & Ohio Railroad.

The final results of the second period, from Jan. 1, 1880, to Oct. 31, 1880, are as follows:

The Grand Trunk (east of Toronto) carried 10.73 per cent. of the total Chicago tonnage, of which there was received:

From the Chicago & Grand Trunk 6.80 per cent.
From the Michigan Central 3.81 per cent.
From the Lake Shore 0.12 per cent.

Total 10.73 per cent.

The New York Central Railroad carried 38.26 per cent. of the total Chicago tonnage, of which there was received:

From the Michigan Central 20.64 per cent.
From the Lake Shore 17.62 per cent.

Total 38.26 per cent.

The New York, Lake Erie & Western carried 19.28 per cent. of the total Chicago tonnage, of which there was received:

From the Grand Trunk 3.87 per cent.
From the Michigan Central 2.59 per cent.
From the Lake Shore 5.88 per cent.
From the Fort Wayne 0.69 per cent.
From the Pan-Handle and Atlantic & G. Western 6.25 per cent.

Total 19.28 per cent.

The Pennsylvania Railroad carried 20.99 per cent. of the total Chicago tonnage, of which there was received:

From the Lake Shore 1.87 per cent.
From the Fort Wayne 17.24 per cent.
From the Pan-Handle 1.88 per cent.

Total 20.99 per cent.

The Baltimore & Ohio carried 5.91 per cent. of the total Chicago tonnage, all of which was received from the Chicago Branch of the Baltimore & Ohio.

Statement No. 189 A shows statistics of the "Michigan Central Railroad's Chicago tonnage" for the same two periods of time already referred to in Statement No. 189. It is submitted for the purpose of enabling the parties interested to arrive at an agreement for a division of the Michigan Central Railroad's Chicago traffic between the Canada roads.

The final results of the first period, from June 9, 1879, to May 31, 1880, are as follows:

The Grand Trunk Railway (west of Toronto) received 18.82 per cent. of the Michigan Central's total Chicago tonnage.

The Great Western Railway received 0.10 per cent. of the Michigan Central's total Chicago tonnage (said tonnage being destined to Toronto).

The Great Western & Canada Southern pool received 81.81 per cent. of the Michigan Central's total Chicago tonnage.

The final results of the second period, from June 1, 1880, to Oct. 31, 1880, are as follows:

The Grand Trunk Railway (west of Toronto) received 14.40 per cent. of the Michigan Central's total Chicago tonnage.

The Great Western received 0.16 per cent. of the Michigan Central's total Chicago tonnage (said tonnage being destined to Toronto). The Great Western and Canada Southern pool received 85.44 per cent. of the Michigan Central's total Chicago tonnage.

The information given in statements Nos. 189 and 189 A furnishes sufficient data to enable the trunk roads and the Canada roads to come to an agreement for the division of the Chicago traffic. I would, therefore, suggest that, after the statements have been examined, each party interested notify me that they are ready and willing to proceed to a division of the traffic, whereupon I will appoint a day for a meeting of all the roads interested, viz., the six Chicago roads, the three Canada roads, and the five trunk roads.

THE SCRAP HEAP.

The Fontaine Friction Driver Locomotive.

The Detroit Post and Tribune, of Jan. 6, says:

"The new trucks for the Fontaine locomotive are at the shops on Grosse Isle, and Mr. Fontaine left for that place yesterday, his intention being to have the trucks placed in position within a day or two. The engine has been kept running on the Toledo Division of the Canada Southern for the last month, and is every day winning golden opinions from all who see its workings. Division Superintendent Murray is much pleased with the manner in which the engine does its duty, and he recently made the assertion that no standard engine on the road equalled the Fontaine in pulling capacity. A train of 38 loaded freight cars was, a few days ago, during the extreme cold weather, pulled over the division in quicker time than was ever made before under the same circumstances. It is said that the locomotive also effects a remarkable saving in coal. Since the day of the trip to Oxford on the Detroit & Bay City road the locomotive has made from 175 to 250 miles daily. The new trucks for the engine arrived some two weeks ago, but the business of the road has been so heavy that the Superintendent has been unwilling to lose the services of the locomotive long enough to have the change made."

The new truck has since been put in use and with it the locomotive has run at the rate of over 60 miles an hour on the Canada Southern.

The Governor of Pennsylvania on the Railroad Question.

Governor Hoyt, of Pennsylvania, in his annual message to the Legislature, says: "The relation of common carriers, more especially of the trunk railroads, to the commerce of the country has assumed a very important economic aspect. So far as the control of inter-state traffic is concerned, it must be remanded to the National Legislature. Our own statutes must terminate in their operation at our state lines. Within these lines, there are certain policies to be executed, so obviously just and right as to preclude question or debate. Our constitution has both defined them, and, by its mandate, provided the details of their enforcement. Your attention is called to the fact that this requirement of the constitution has not, up to this time, been complied with."

"That all shippers in the state may be in condition to have the protection of statute law, it is urged that you enact the necessary legislation so that the provisions of the constitution may be placed in reach of execution by the courts over all transportation companies, at all times, in all places and in all interests."

Changed His Mind.

There lately died in this state an old man who once held the position of Superintendent of a Michigan railroad, 26 miles long. The Superintendent, of course, knew that there were several other railroads in the United States, but he seemed to have the idea that he carried the whole railroad system of the country in his vest-pocket. Every employee was instructed to remove his hat when speaking to the great man. He insisted on his conductors wearing plug-hats, and once discharged an engineer for not having his boots blackened while on his run.

In the height of his career, the Superintendent was suddenly taken ill. He worried greatly for fear the trains would not come and go, if he were not at the depot, and in a week he was dangerously ill. At the end of a fortnight the doctor frankly told him that he had better prepare for the worst. In this emergency one of the conductors was sent for, and the patient began:

"Mr. Jones, I suppose the news has been telegraphed all over the country that I am dangerously ill?"

"I suppose so," was the answer.

"Is it generally realized that my death will be a sad blow to the railroad interests of America?"

"I presume it is."

"Has the news of my dangerous situation depressed our stock any?"

"No, I think not."

"What? Hasn't it sent our stock down a bit?"

"No, sir. On the contrary, it has gone up to 84."

"Then I'll see 'em hanged before I die!" gasped the patient; and in two weeks he was able to ride out.—*Chicago Tribune*.

Cattle Frozen to Death.

On last Friday morning (Dec. 30), when the freight train on the Delaware, Lackawanna & Western Railroad passed through Dover, a car load of cattle was left at the station for transfer to the Bonton Branch train which leaves there at 5:22 a. m. Before the train started an examination of the car was made and fifteen cattle were found frozen to death, among them several heavy heifers. On taking the dead cattle out of the car several live ones were found underneath them, they having worked their way under the weaker ones for warmth. The cattle came from Port Jervis, and were shipped to parties in Hoboken.—*Newark (N. J.) Advertiser*.



Published Every Friday.

CONDUCTED BY

S. WRIGHT DUNNING AND M. N. FORNEY.

CONTENTS.

ILLUSTRATIONS:	Page.	GENERAL RAILROAD NEWS:	Page.
Locomotive Diagrams —	24	Old and New Roads.....	24
Centre of Gravity	14	ANNUAL REPORTS:	
Fast Express Locomotive, with Wootten Fire-Box 16, 17	26	New Haven & Northampton.....	26
CONTRIBUTIONS:		Wabash, St. Louis & Pacific.....	27
The Control of Reading.....	13	Long Island.....	27
The Diameter of Locomotive Boiler Tubes.....	13	Northeastern (S. C.).....	27
The Best Position for the Centre of Gravity of Locomotives.....	14	Boston & Lowell.....	27
Calculating Quantities in Earth Work.....	15	Pittsburgh, Titusville & Buffalo.....	27
EDITORIALS:		Cleveland, Columbus, Cincinnati & Indianapolis.....	28
Wootten's Fast Express Locomotive.....	20	Pittsburgh & Lake Erie.....	28
The Growth of Western Traffic.....	21	New York State Railroads.....	28
Record of New Railroad Construction.....	21	MISCELLANEOUS:	
GENERAL RAILROAD NEWS:		The Telegraph Combination.....	15
Meetings and Announcements.....	22	The Pullman Suit Against the Baltimore & Ohio.....	17
Elections and Appointments.....	22	The Central Vermont and Northern War.....	17
Personal.....	23	The Massachusetts Commissioners on Railroad Regulation.....	17
Traffic and Earnings.....	23	The Metric System Again.....	18
Railroad Law.....	24	Chicago Shipments Under the Pool.....	19
The Scrap Heap.....	19, 24	The Massachusetts Railroad Commission on the Fall River Boiler Explosion.....	19

EDITORIAL ANNOUNCEMENTS.

Passes.—All persons connected with this paper are forbidden to ask for passes under any circumstances, and we will be thankful to have any act of the kind reported to this office.

Addresses.—Business letters should be addressed and drafts made payable to THE RAILROAD GAZETTE. Communications for the attention of the Editors should be addressed to the EDITOR RAILROAD GAZETTE.

Advertisements.—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. We give in our editorial columns our own opinions, and those only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.

Contributions.—Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies, the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and in their management, particulars as to the business of railroads, and suggestions as to its improvement. Discussions of subjects pertaining to ALL DEPARTMENTS of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.

WOOTTEN'S FAST EXPRESS LOCOMOTIVE.

Many of our readers will be very much interested in the engravings published last week and in this number, which show the construction of the fast and heavy express locomotives now used on the Bound Brook line of the Reading Railroad. These are the heaviest locomotives ever built in this country for fast passenger service, and some idea may be formed of the rapid increase in the size and capacity of such engines, if we compare their weight, 96,200 lbs., with that of the standard 16×24 in. cylinder engines of ten or fifteen years ago, which weighed rather less than two-thirds as much. The weight on the driving wheels of the older engines was a little more than 10,000 lbs. per wheel, that on Mr. Wootten's locomotives is over 16,000 lbs. per wheel.

The novel feature about them, though, is the construction of the fire-box, which is shown very clearly in the sectional and end views given in this number. It must be kept in mind, though, that this form of fire-box was originally designed for burning the fine waste coal from the anthracite mines. To what extent this is done in freight engines we are unable to say, but on the passenger engines ordinary merchantable anthracite coal is used.

The reason for providing a larger grate for anthracite than is needed for bituminous coal is that the former burns much more slowly than the latter. This is due to the much larger amount of volatile matter in bituminous coal and of fixed carbon in anthracite.

The following data, given by Professor Johnson in his report on coals, will show this:

	Volatile matter.	Fixed carbon.
	Per cent.	Per cent.
Anthracite.....	3.97	88.54
Free-burning bituminous.....	15.11	73.23
Bituminous coking coal.....	29.43	58.29

The volatile matter of the bituminous coals is given off in the form of hydro-carbon gases at comparatively low temperatures. At the same time, such coal swells considerably in coking, thus facilitating the access of air, which effects the combustion of both the gases given off above the fuel and the solid carbon which remains. The difference in the character of the two kinds of coals in this respect, is shown by the ease with which a fire can be made of bituminous coal, in an ordinary grate, and the difficulty of kindling one of anthracite coal.

There are no data that we know of which show from actual experiment the rate of combustion of the two kinds of coals under the same conditions. A report, made in 1878 to the Engineer in Chief of the Bureau of Steam Engineering of the United States Navy, by a board of engineers, on the qualities of various kinds of coals, contains some data relating to this question. In the report of the experiments it is said that "the rate of combustion was as great as the experimental conditions permitted." It is also stated, though, that "no comparison can be made between the different coals as regards their rapidity of burning, because the experiments in them, not being simultaneous, were differently affected, and to a very great degree, by the different atmospheric conditions." Nevertheless, they give some idea of the relative rate at which the different kinds of coal could be burned under the experimental conditions which were then employed. These rates were as follows:

	Kind of Coal.			
	West Va.	West Va.	Semi-bituminous.	Anthracite.
Pounds of coal burned 1 per hour, per square foot of grate surface.....	21.21	14.36	13.98	12.95
Pounds of water evaporated per pound of coal, from 212 degrees Fahrenheit and under the atmospheric pressure.....	7.58	10.13	9.60	9.08
Pounds of water vaporized per pound of the gasifiable portion of the coal, from 212 degrees Fahrenheit and under the atmospheric pressure.....	8.06	10.82	11.05	11.84

That is, under the conditions given, 8 per cent. more semi-bituminous, 10.8 more bituminous and 63.7 per cent. more splint than anthracite coal was burned. The experiments were made with an ordinary chimney draft, and very little idea can be formed of what the relative rate of combustion would be under the powerful stimulant of a blast pipe in a locomotive boiler. At the rate of combustion of 53 lbs. of anthracite coal per minute, which was given last week as the consumption of Mr. Wootten's engine, "when doing full work," it would burn nearly 42 lbs. per square foot of grate per hour, and we know that locomotives often consume bituminous coal at a rate of over a hundred pounds per square foot per hour. A series of experiments to determine the rate at which the various kinds of coal can be burned would have very great value, and would be a guide in proportioning the size of fire-box to the fuel used. Some day, perhaps, railroad companies will wake up to the fact that although there may be bliss in ignorance, there is not as much money in it as there is in knowledge, and then — well, we will not anticipate the millennium. Meanwhile we will be obliged to guess at things as best we may. Colburn says that locomotives burn from 50 to 150 pounds of bituminous coal per square foot of grate surface per hour. Haswell gives the maximum rate at 120 pounds. Probably, the rate at which Mr. Wootten's engine consumes coal, "when doing full work," is not its maximum rate, so that our data are not definite enough to enable us to draw any reliable deductions, excepting that a very considerably larger grate is required to burn anthracite than is needed for bituminous coals.

Reference has been made in these columns to experiments made with a Wootten fire-box on the Camden & Atlantic Railroad by Mr. Rufus Hill, Master Mechanic of that line, to determine the best proportions of grate area for burning bituminous coal. Experimental runs were made from Camden to Atlantic City, a distance of 58.59 miles, and return. The experiments, Mr. Hill reports, were made "without any effort on the part of the engineer or fireman to economize in the use of steam or fuel—a mere natural run without any instructions to do any different from everyday practice." In both cases the trains consisted of four cars to Atlantic City and five cars back. On one trip the engine was run with the entire grate open. It then consumed 5,495 lbs. of coal.

The grate was then covered with fire-brick at the

*The engine was a good deal lighter than the one illustrated in this number of the *Railroad Gazette*.

front end, back of the bridge-wall, for a distance of 31 in., and the entire width of the fire-box, so that one-third of the grate was covered and two-thirds open. Under these conditions and with the same trains the engine burned 4,900 lbs. in making the round trip. Under the latter conditions Mr. Hill reported:

"Perfect combustion seemed to be obtained; no sparks left the furnace, or, in other words, no sparks were drawn through the flues; only the very light products resembling ash were distinguishable. No smoke was observable; a slight discoloration only was visible when firing hard, and when the fire was broken up with a slash bar. The engine steamed up to the blowing-off point continually. No one would know that the engine used soft coal unless the fact was pointed out to them."

With the grate entirely open, as it was on the first run, there was "an increase of smoke, and the cinders were noticeable. Attention was called to this, by the train-hands, but there was not enough smoke or cinders to be annoying."

The experiments indicate that, with light trains, the grate was larger than is economical for burning bituminous coal. What the result would have been with heavy trains it is, perhaps, impossible to tell without further experiments. It does not follow, though, that the fire-box is too large, even if it has been proved that there is more grate area than is economical. Although Clark's maxim that "there may be too much grate area for economical evaporation, but there cannot be too little, so long as the required rate of combustion per square foot does not exceed the limits imposed by physical conditions," may be true, it may nevertheless be desirable to have the fire-box as large as possible. What appears to be needed in burning bituminous coal is to bring the air and fuel into as intimate contact as possible on the grate, and then to give them as much room to mix above it as possible. Two streams of water, a muddy and a clear one, will flow alongside of each other in the same channel for a long distance without mingling, but if they empty into a lake or pond they will soon mix. A similar action occurs above the fire on a grate, if there is room enough there for partial quiescence. The gases and air will then soon mix and perfect combustion will take place. What appears to be needed is, first, a grate not larger than is needed to burn the requisite quantity of coal to do the work, and then as much room above it in the fire-box as possible.

The facilities which Mr. Wootten's form of fire-box gives for making a thorough series of experiments to determine the most economical size of grate for the different kinds of fuel have been pointed out in these pages before.

In an article on "Passenger Engines," published in the *Railroad Gazette* three weeks ago, the following conclusions were drawn:

"What is needed for a fast passenger engine with trains of 15 or 16 cars is:

"First, a fire-box about three times as large as those used on the old 16×24 in. cylinder engines.

"Second, as large a barrel of boiler as possible and tubes somewhat larger in diameter than usual.

"Third, as much weight on each of four driving-wheels as will be permitted on the rails.

"Fourth, five cubic inches of cylinder capacity per inch of circumference of driving-wheels per ton (of 2,000 lbs.) on the wheels.

"Fifth, the stroke of pistons should be 80 per cent. of the diameter of driving-wheels."

Let us see how nearly Mr. Wootten's engines fulfill these conditions.

The old 16×24 in. cylinder engines had about 15 square feet of grate area. The proposed engines, by the above rule, would require 45. This proportion was based on the supposition that bituminous coal would be burned. Mr. Wootten's engine has 76 square feet, which may not be too large for anthracite, but probably is greater than is needed for bituminous coal.

The barrel of the boiler is 58 $\frac{3}{4}$ in. in diameter, and could be made larger on an engine of this design, but this, of course, would increase its weight. According to the calculations of three weeks ago it should be 79 $\frac{1}{4}$ in. diameter. It is, though, impossible to have it of that size, and therefore it must be made as large as the limits of weight and space will permit.

The proportion which the weight on the driving-wheels or adhesive weight should bear to the loads hauled was not discussed in the article referred to, but was merely mentioned. It is evident, though, that to attain the same speed, in the same time and distance, the adhesive weight should be proportionate to the loads to be hauled. That is, to get up a speed of 30 miles per hour, with a train weighing 375 tons, requires 50 per cent. more adhesive weight than is needed to attain the same speed with a train of 250 tons. Of course, to get up a speed of 45 miles per hour with a train of 375 tons, in the same time required to run 30 miles per hour with 250 tons of load, would make a much more than proportionate amount of adhesion necessary.

Assuming then the same hypothetical weights and speeds for trains and engines that were given in the article referred to, we find that the locomotive illus-

trated this week and last has a weight on the driving-wheels somewhat more than 50 per cent. greater than that of the old 30-ton engines. The more adhesive weight there is, though, the quicker can a high speed be attained. As there is room for a larger boiler in an engine of this design, and as an increase of capacity would be desirable, it becomes simply a question of the ability of the track to resist or carry greater weights. If it can, the engine would be more efficient if the barrel of the boiler was increased in diameter.

The cylinder capacity of Mr. Wootten's engine is about 4.45 cubic inches per inch of circumference of driving-wheels per ton of adhesive weight, instead of 5 cubic inches. It seems probable that a somewhat larger cylinder might be desirable.

The stroke of pistons is 32.35 per cent. of the diameter of the wheels, instead of 30, as proposed.

The distance from centre to centre of driving-wheels is seven feet, so that the coupling-rods are comparatively short—a matter of some importance in locomotives to run at a high speed.

Altogether, though, the engines fulfill more nearly the conditions which were deduced from merely theoretical considerations than any which have thus far been built in this country for running fast and heavy trains. It need not be surprising, then, that they are doing their work in a very satisfactory way.

The great height of the boiler, though, may by some be regarded as the most serious objection to these locomotives. The distance from top of rail to centre of boiler is 92 in. From 70 to 72 in. is the ordinary height. As this view of the subject is very fully discussed on another page, in Mr. F. C. Wootten's thesis, it will not be taken up here, excepting to say that it is doubtful whether a man blindfolded could tell whether he was riding on an engine with the boiler 72 or 92 in. high. The height of the boiler of the engine having a single pair of 6 ft. 6 in. wheels, built at the Baldwin Locomotive Works last year, and illustrated in our issues of May 7 and June 11, was 88 in., so that Mr. Wootten's is only 4 in. higher.

THE GROWTH OF WESTERN TRAFFIC.

The returns of receipts of leading staples of traffic of some of the principal Western cities have been made, from which we take the following for Chicago :

	1880.	1879.	Inc. or Dec.	P. c.
Flour, bbls.	3,377,313	3,369,958	1.7	0.2
Wheat, bush.	23,313,560	34,106,100	D.	10,792,549
Corn,	95,840,145	64,339,321	I.	31,506,824
Oats,	21,852,073	16,660,428	I.	5,191,645
Rye,	1,841,142	2,497,340	D.	650,198
Barley,	5,274,428	4,936,562	I.	337,866

Flour and grain,				
bush.	165,013,913	139,389,550		
Seeds, 100 lbs.	2,459,973	1,697,725	I.	762,248
Hog products,				
100 lbs.	2,338,127	2,268,861	I.	69,266
Butter, 100 lbs.	670,358	546,232	I.	130,126
Live hogs, No.	7,066,144	6,448,300	I.	617,844
Cattle, No.	1,382,346	1,215,732	I.	166,614
Lumber, M.	1,556,134	1,469,879	I.	86,255
Shingles, M.	632,547	670,644	D.	18,067

Although there is an increase of 18.4 per cent. in the total grain receipts, there was a falling off of no less than 31.6 per cent. in the wheat receipts, which was doubtless due to the fact that an exceptionally large proportion of the great wheat crop of the year was in a part of the country too far south and east to ship to advantage by way of Chicago. The corn receipts increased no less than 49 per cent., and were, in 1880, 58 per cent. of the total grain receipts, against 21.5 per cent. in 1879.

The statement for St. Louis is as follows :

	1880.	1879.	Inc. or Dec.	P. c.
Flour, bbls.	1,612,627	1,607,236	I.	5,391
Wheat, bush.	18,439,403	17,063,362	I.	1,346,041
Corn,	21,237,157	13,360,636	I.	7,866,521
Oats,	5,127,078	5,002,165	I.	124,913
Rye and Barley, bush.	2,903,440	2,544,235	I.	359,205

Flour and grain, bush. 55,760,213 46,036,578 I. 9,723,635 21.1

*Cotton, bales. 496,570 335,706 I. 160,774 48.0

Hogs, No. 1,839,084 1,772,724 I. 76,960 4.4

Cattle, No. 424,720 420,654 I. 4,066 1.0

*Year ending Aug. 31.

St. Louis thus has an increase of 21.1 per cent. in grain, against 18.4 at Chicago; but in amount the increase at St. Louis is about three eighths as great as that at Chicago. It approaches Chicago most nearly in wheat receipts, the latter city having one-fourth more this year, while it had twice as much last year. St. Louis, however, is situated just where wheat production has increased most of late years, and its increase over 1879 is not very large. Chicago this year received more than four times as much corn and oats as St. Louis, nearly four times as many hogs, and more than three times as many cattle. Its increase in cattle and hogs was a much greater percentage than the increase at St. Louis.

Milwaukee reports the following receipts :

	1880.	1879.	Inc. or Dec.	P. c.
Flour, bbls.	2,392,952	2,390,673	D.	6,721
Wheat, bush.	10,919,994	19,649,352	D.	8,729,358
Corn,	2,119,855	1,369,634	I.	750,221
Oats,	2,006,646	1,705,062	I.	301,584
Rye,	779,063	856,124	D.	76,161
Barley,	3,238,741	3,895,759	D.	657,018

Flour and grain, bush. 31,029,659 39,474,286 D. 8,444,327 21.4

Hogs, No. 627,513 620,527 6,986 1.1

An overwhelmingly large proportion of Milwaukee's receipts consists of wheat and flour, which the partial failure of the wheat crop in 1879 reduced very greatly in 1880, so that its total grain receipts fell off 21.4 per cent., against an increase of 18.4 per cent. at Chicago, and of 21.1 per cent. at St. Louis. The aggregate decrease in wheat receipts at Chicago and Milwaukee was 19,522,000 bushels, against which there was an increase of but 1,346,000 bushels at St. Louis. Milwaukee's lumber business, not reported above, is important, but the city seems to be becoming more important as a manufacturing than as a commercial city. The figures for ten successive years show its flour, wheat and other grain receipts to have been as follows :

Year.	Wheat.	Flour and Wheat.	Other grains.	Total.
1871.	15,686,611	19,670,521	3,609,619	23,280,140
1872.	13,618,959	17,780,960	5,605,368	23,305,337
1873.	28,457,937	34,732,042	4,109,628	38,841,670
1874.	25,268,143	33,349,833	4,445,579	37,795,412
1875.	27,878,727	35,007,732	4,299,287	39,307,019
1876.	18,174,817	28,588,257	4,028,809	33,517,066
1877.	19,303,709	28,800,809	5,217,079	34,017,888
1878.	21,401,953	32,718,468	6,450,783	39,169,256
1879.	19,649,352	30,447,837	9,026,449	39,474,286
1880.	10,919,994	22,884,754	8,145,205	31,029,659

Thus, in spite of a considerable increase in "other grains," Milwaukee has had but once any increase over its total grain receipts in 1875, and that but trifling, and in 1880 its receipts were much smaller than in any other year since 1872. The increase in "other grains" is largely in barley, the brewing business at Milwaukee being great and growing. The decrease in wheat, which is very decided, is doubtless due largely to the abandonment of wheat cultivation in Wisconsin for something more profitable, and Milwaukee has a large business in supplying the lumber regions and the Lake Superior mining country with corn, oats and other provisions, while the larger wheat country further west, in Minnesota and Dakota, markets its grain at Milwaukee less than formerly. In wheat alone its receipts culminated as long ago as 1873, when they were nearly three times as great as last year, and when in wheat and flour together they were one-half more.

Chicago grain receipts for ten years have been :

Year.	Flour, bbls.	Wheat, bush.	Corn, bush.	Grain and Flour, bush.
1871.	1,412,077	14,439,656	41,853,138	84,221,791
1872.	1,532,014	12,724,141	47,366,087	80,192,849
1873.	1,487,376	20,200,502	38,157,232	100,180,101
1874.	2,066,079	29,764,622	35,799,938	96,945,053
1875.	2,025,883	24,296,370	34,314,150	82,400,243
1876.	2,055,107	16,774,058	48,068,040	90,213,181
1877.	2,091,142	14,164,515	47,015,729	95,761,070
1878.	3,030,562	27,713,577	63,651,518	135,001,878
1879.	3,369,938	34,106,109	64,330,321	139,704,571
1880.	3,377,313	23,313,560	95,846,145	163,010,728

The wheat receipts, it will be seen from this, have fluctuated greatly. They were more in 1871 than in 1877; as much in 1874 as in 1873; more in 1873 than in 1880, and most in 1879. The receipts of 1880 have been exceeded in 1873, 1874, 1875, 1878 and 1879, and were nearly the average of the 10 years (22,321,000). In the three years from 1873 to 1875 the wheat receipts were nearly as great as in the last three years.

In corn receipts we see a steady decrease from 1872 to 1875, and an increase since, which in 1880 vastly exceeded that of any other year, though the 1879 receipts had never been equalled. Corn is the great grain of Chicago, and there is no other place that can compare with it in this respect.

In the totals of all grains we see that the receipts were comparatively stationary until after 1877. The greatest increase in any one year was from 1877 to 1878, nearly 40,000,000 bushels and 41 1/2 per cent. This it was, largely, which started the country on its present prosperous career. The next increase in amount was from 1879 to 1880, nearly 24,000,000 bushels, and 17 per cent. This increase alone is equal to nearly one-half the total receipts of St. Louis in 1880, and to three-fourths of Milwaukee's receipts. Its total grain receipts in 1880 were three and a quarter times those of St. Louis and five and a quarter times those of Milwaukee.

Let us now examine St. Louis' grain receipts for 10 years, which have been as follows :

Year.	Flour, bbls.	Wheat, bush.	Corn, bush.	Flour and grain, bush.
1871.	1,428,408	7,311,910	6,030,734	20,063,330
1872.	1,259,933	6,037,987	4,749,287	28,805,912
1873.	1,204,500	6,116,088	7,633,075	27,000,174
1874.	1,038,998	8,255,321	6,991,077	20,448,504
1875.	1,300,381	7,604,205	6,710,264	27,400,820
1876.	1,071,430	8,037,574	15,249,960	34,198,376
1877.	1,092,173	7,008,012	11,705,631	29,727,071
1878.	1,259,704	15,479,965	8,816,544	34,700,137
1879.	1,607,230	17,063,302	13,360,636	40,036,578
1880.	1,612,627	18,430,403	21,257,157	55,700,213

St. Louis showed little growth in grain traffic until 1876, when its corn receipts were twice as great as ever before. In 1878 and since it shows the effect of the increased cultivation of winter wheat in its latitude, which at first was partly at the expense of corn, it appears. But its wheat receipts doubled from 1877 to 1878, and have continued to increase since, so that, as we have said, in 1880 it had nearly three-fourths as much as the Chicago receipts and nearly twice the Milwaukee receipts. Taking its total grain receipts, they have increased 113.7 per cent. since 1871, while

Chicago's have increased but 94 1/2 per cent. But the amount of Chicago's increase in this time is 79,400,000 bushels, while St. Louis' has been but 29,700,000. If we go back only to 1875, from which time St. Louis has made nearly all its increase, we find a gain of 103 per cent. there, amounting to 28,300,000 bushels, and at Chicago a gain of 98 1/2 per cent., amounting to 81,200,000 bushels. Thus, however much St. Louis may have profited by the improvement of the mouth of the Mississippi and the greater wheat production in its latitude, Chicago has gained very nearly as much in proportion and vastly more in quantity in other directions, so that in relative position Chicago is nearly as far ahead as ever in the grain business. Thus, the amounts and the percentages of the receipts of Chicago over those of St. Louis in different years have been :

1871.	58,130,000 bushels	= 223 per cent.

<tbl_r cells="3" ix="1" maxcspan="1" maxrspan="1" usedcols="

A TELEGRAPH CONSOLIDATION is announced which gives us occasion to republish some comments we made at the time of the union of the Western Union and the Atlantic & Pacific, nearly three years and a half ago. In addition to the inducements there mentioned to start a rival telegraph company and afterwards unite with the old one, is the opportunity which it affords for making a gigantic speculation. The new company spoils business, and this brings down the old company's stock, and the promoters of the new company make one fortune out of that; then they load themselves up with the low-priced stock, agree on a combination or consolidation, and make another fortune on the rise. The parties who started the American Union Company are largely the same as those who managed the Atlantic & Pacific affair some years ago, and it is not easy to see why these tactics cannot be repeated an indefinite number of times.

DECEMBER EARNINGS are reported in the *Commercial and Financial Chronicle* for 43 railroads, eight of which, however, give earnings for only three weeks of the month. These 43 roads, with 18 per cent. more mileage, earned 15.6 per cent. more money, and their average earnings per mile decreased from \$529 to \$511 per mile, which, as the earnings were extraordinarily large and there is a great addition of new road, is a very excellent showing. The same journal gives a table for the year including 41 roads, and the lack of a week's or ten days' earnings in several of the roads will of course make much less difference proportionately on the year's than on the month's returns. These roads show an increase of nearly 27 per cent. in total earnings, and though their increase in mileage was large, it was not nearly so great as this.

General Railroad News.

MEETINGS AND ANNOUNCEMENTS.

Meetings.

Meetings will be held as follows:

Marietta & Cincinnati, annual meeting, at the office in Cincinnati, Feb. 16.

St. Louis, Iron Mountain & Southern, special meeting, in St. Louis, March 7, to vote on the question of authorizing additional issues of stock and bonds.

St. Louis & San Francisco, special meeting, in St. Louis, March 1, to vote on the creation of a consolidated mortgage.

Dividends.

Dividends have been declared as follows:

Atchison, Topeka & Santa Fe, 2 per cent., quarterly, payable Feb. 15.

Rhode Island & Massachusetts (leased to New York & New England), 3 per cent., semi-annual.

Cleveland, Columbus, Cincinnati & Indianapolis, 5 per cent. from the earnings of the year 1880, payable Feb. 1. A year ago the company paid 2½ per cent.

Central Pacific, 3 per cent., semi-annual, payable Feb. 1.

Wabash, St. Louis & Pacific, 1½ per cent., quarterly, on the preferred stock, payable Feb. 10. This is the first dividend.

Foreclosure Sales.

The *Rochester & State Line* road was sold in Rochester, N. Y., Jan. 8, under foreclosure of mortgage, and bought for \$600,000 by Walston H. Brown, representing the Purchasing Committee of bondholders. The road is 108 miles long, from Rochester, N. Y., to Salamanca. A majority of the bondholders, who bought it, have arranged a plan of reorganization, the terms of which were recently noted.

Brotherhood of Locomotive Engineers.

The January number of the *Journal* of this organization reports six members admitted by card, 13 re-instated, 10 withdrawals, one suspended and 14 expulsions, showing a net loss of six members.

ELECTIONS AND APPOINTMENTS.

Baltimore & Delta.—At the annual meeting in Belair, Md., Jan. 6, the following directors were chosen: William H. Waters, Stevenson Archer, Eli Tucker, E. S. Rogers, James P. Streett, Caleb J. Moore, Thomas Armstrong, Wm. Gilmore, A. W. Bradford, P. T. George, Charles W. Hatter, Foulk Jones, S. G. Boyd. The board re-elected Wm. H. Waters, President; Wm. Gilmore, Vice-President; S. G. Boyd, Secretary; Thomas Armstrong, Treasurer.

Baltimore & Ohio.—Mr. W. H. Harrison has been appointed Master of Machinery of the Trans-OHio divisions, with office at Newark, O. He has been for some time Assistant Master Mechanic, and is known as an efficient and capable officer.

Baltimore, Pittsburgh & Chicago.—At the annual meeting in Pittsburgh, Jan. 10, the following officers were elected: President, Wm. E. Schmertz; Vice-President, Wm. Vankirk; directors, Simon Beymer, George A. Kelly, D. W. C. Carroll, J. D. Long, John G. Holmes, Charles H. Caldwell, James M. Bailey, F. B. Laughlin, Joshua Rhodes, Pittsburgh; Wm. P. Townsend, New Brighton, Pa.; Albert Ingard, J. H. Kauke, Wooster, O. The board completed its organization by the election of the following: Assistant to President and General Counsel, J. H. McCreery; Secretary, Wm. McClelland; Treasurer, Cyrus Clarke, Jr.

Baltimore, Pittsburgh & Chicago, Ohio Division.—The following officers have been elected: President, J. H. Kirke, LaFayette, O.; Vice-President, Wm. Mathers, New Lisbon, O.; Secretary, Albert Imgard, Wooster, O.; Treasurer, L. P. Ohlter.

Boston & Lowell.—At the annual meeting in Boston, Jan. 5, the old board was re-elected, as follows: Josiah G. Abbot, Wm. A. Burke, Frederick E. Clarke, T. Jefferson Coolidge, Hocum Hosford, Edwin Morey, Thomas Talbot.

Catskill Mountain Extension.—The directors of this new company are: John Avery, J. H. Badgeley, Isaac Bruyn, Wm. Donohue, J. O. Gaylord, A. P. Jones, A. J. Markin, M. B. Mattice, J. Miero, Jr., A. M. Osborn, H. A. Paterson, W. W. Rider, H. Van Steenburgh.

Chicago & Northwestern.—The following circular is dated Jan. 1:

"Mr. W. N. Babcock (late General Agent of the Union Pacific) is appointed General Agent (for freight and passenger departments) of this company, in the state of Colorado, with headquarters at No. 263 Sixteenth street, (Tabor Block), Denver; in place of Mr. V. M. Came, resigned. All claims for loss, damage or overcharges on freight consigned

to Colorado points should be promptly forwarded to Mr. Babcock."

Chicago, Rock Island & Pacific.—Mr. R. H. Chamberlin has been appointed Superintendent of the Illinois Division, with office in Chicago. He has been Train-Master for several years.

Chicago, St. Paul, Minneapolis & Omaha.—The following circulars are dated St. Paul, Minn., Dec. 31:

"Mr. T. W. Teasdale is appointed General Agent of this line in charge of matters relating to the passenger and baggage business, with headquarters at St. Paul. To take effect Jan. 1, 1881."

"Mr. J. R. Reniff is appointed Master Car-BUILDER of this line, with headquarters at Sioux City. To take effect Jan. 1, 1881."

Cleveland, Columbus, Cincinnati & Indianapolis.—Mr. O. B. Skinner is appointed Traffic Manager, a new office on this road. He has been for some time General Manager of the Merchants' Dispatch Line.

Colorado Central.—At the annual meeting in Golden, Col., recently, the following directors were chosen: F. L. Ames, Elisha Atkins, E. L. Berthoud, F. Gordon Dexter, Sidney Dillon, A. A. Egbert, Jay Gould, W. A. H. H. Loveland, Ivers Phillips, Russell Sage, C. C. Welch. The road is worked by the Union Pacific Company.

Cumberland & Pennsylvania.—Mr. Charles F. Mayer has been re-elected President, and Mr. Charles W. Keim, Secretary.

Delaware Western.—At the annual meeting in Wilmington, Del., Jan. 10, the old directors were re-elected as follows: Henry S. McComb, William T. Carter, William M. Canby, William Canby, Henry C. Robinson, James L. DeVon, John P. Springer.

Denver & Pacific.—The directors of this new company are J. R. McBride, M. Shaughnessy, E. H. Murray, A. L. Thomas, P. H. Lannan. Office in Ogden, Utah.

Denver & Rio Grande.—The following circular is dated Denver, Jan. 1:

"George W. Cushing has this day been appointed General Superintendent, office, Denver, Colorado."

Mr. Cushing was recently Superintendent of Machinery on the Missouri, Kansas & Texas, and was previously in a similar capacity on the Northern Pacific and the Chicago & Northwestern.

Engineers' Club of Philadelphia.—At the annual meeting, Jan. 8, the following officers were chosen: President, Strickland Kneass; Vice-President, Henry G. Morris; Recording Secretary, Wilfred Lewis; Corresponding Secretary, Howard Murphy; Treasurer, A. R. Roberts; Board of Directors, Frederic Graff, Rudolph Hering, J. J. DeKinder, T. M. Cleeman and George Burnham, Jr.

Indianapolis, Coal & Southern.—The directors of this new company are E. B. Martindale, Austin H. Brown, T. A. Morris, N. S. Byram, William Wallace, John W. Murphy, H. R. Allen, Hervy Bates, A. L. Wright, Ingram Fletcher, Thomas H. Sharpe, Fred Baggs, T. A. Lewis.

Indianapolis & St. Louis.—Mr. O. B. Skinner is appointed Traffic Manager. He holds the same office on the Cleveland, Columbus, Cincinnati & Indianapolis.

Indianapolis & Springfield.—At the annual meeting in Indianapolis, Jan. 4, the following directors were chosen: T. A. Morris, M. D. Manson, Wm. D. Wiles, J. H. Piercy, L. Hunt, D. Nichols, J. Bridger, T. Thornton, T. N. Rice, G. W. McCum, John Lee, J. Leonard, E. P. Schlater. The board elected officers as follows: John Lee, President; John H. Piercy, Secretary; Monroe Nicholls, Treasurer; Thomas Rice, Attorney.

Jefferson City, Lebanon & Southwestern.—The board of directors has been reorganized by the election of John J. Church, H. Clay Ewing, Charles M. Hays, J. A. Hill, T. J. Portis and A. A. Talmage to fill vacancies made by resignation. Messrs. S. W. Cox, A. L. Davison and J. M. Clark of the old board remain directors. The company is now controlled by the Missouri Pacific.

Kansas.—The directors of the Kansas Railway Company, a new organization, are: John H. Whitstone, Franklin County, Kan.; J. F. Bradley, J. W. Simecock, Morris County, Kan.; J. K. Finley, Lyon County, Kan.; Alexander Blake, A. B. Cooper, James A. Drake, J. B. Edwards, James Wiley, Osage County, Kan.; T. B. Bullene, Kersey Coates, J. D. S. Cook, D. J. Lynde, Kansas City, Mo.

Lehigh Coal & Navigation Lines.—At the annual meetings in Philadelphia, Jan. 10, officers were chosen as follows by these lines, which are owned by the Lehigh Coal & Navigation Company: *Nesquehoning Valley*.—President, J. B. Moorhead; directors, Francis R. Cope, Samuel Mason, William G. Moorhead, W. P. Cresson, I. V. Williamson, William C. Ludwig, George Whitney, John W. Thomas, E. W. Clark, George F. Tyler, P. C. Garrett, T. Charlton, Henry. *Lehigh & Lackawanna*.—President, E. W. Clark; directors, F. R. Cope, F. Hazard, F. C. Yarnall, Edward Lewis.

Lehigh & Hudson River.—The directors of this new company are as follows: George R. Blanchard, Grinnell Burt, Alfred Ely, D. B. Halstead, Garret A. Hobart, D. F. Merritt, John S. Morton, Thomas C. Platt, Frederick A. Potts, Charles Scranton, Wm. C. Sheldon, Bird W. Spencer, James B. Tillman. The board has elected Grinnell Burt, President; George R. Blanchard, Vice-President; Alfred Ely, Secretary; D. B. Halstead, Treasurer.

Long Island.—Mr. James Thompson has been appointed Master Mechanic, in place of M. Meehan. He will also have charge of the Car Department, the office of Master Car-BUILDER being abolished.

Louisville, Cincinnati & Lexington.—Mr. Jacob F. Kreiger has been chosen President, in place of J. B. Wilder, resigned. Mr. John B. Bangs has been chosen Vice-President.

Mr. S. S. Parker, General Passenger Agent, has been appointed General Freight Agent also. Mr. B. F. Mitchell, late Chief Clerk, is appointed Assistant General Freight and Passenger Agent.

Merchants' Dispatch Line.—Mr. John C. Noyes, it is understood, will be appointed General Manager, in place of O. B. Skinner, who has gone to the Cleveland, Columbus, Cincinnati & Indianapolis. Mr. Noyes has been for some time General Freight Agent of the Indianapolis & St. Louis.

Michigan Central.—A circular from this company announces that hereafter the baggage department will be attached to and be a part of the General Passenger and Ticket Agent's department. Mr. J. N. Stinson will continue as General Baggage Agent, with headquarters at Chicago. Mr. H. R. Dearing has been appointed Assistant General Baggage Agent, with headquarters at Jackson, Mich. He will have general charge of station and train baggagemen. All

claims for loss, damage, or detention of baggage should be sent to Mr. Dearing for adjustment.

Mr. David S. Sutherland is appointed Superintendent of the Eastern Division, with office in Detroit, and R. H. L'Hommedieu, Superintendent of the Grand Rapids Division, with office in Jackson.

Missisquoi & Clyde Rivers.—At the annual meeting recently, the following directors were chosen: J. W. Currier, O. N. Elkins, W. G. Elkins, H. C. Wilson, North Troy, Vt.; J. H. Hamilton, Richford, Vt.; A. B. Chaffee, Montreal. The board elected W. G. Elkins President; O. N. Elkins, Secretary and Treasurer. The road is leased to the South-eastern, of Canada.

New York Elevated.—At the annual meeting in New York, Jan. 11, the following directors were chosen: Cyrus W. Field, David Dows, Asbel H. Barney, John H. Hall, Josiah M. Fiske, Jesse Hoyt, Alfred S. Barnes, John D. Mairs, Heber R. Bishop, Benjamin Brewster, Daniel A. Lindsley, Edward M. Field, James A. Cowing.

New Haven & Northampton.—At the annual meeting in New Haven, Jan. 5, the following directors were chosen: Charles N. Yeomans, Westfield, Mass.; Horatio G. Knight, Easthampton, Mass.; George J. Brush, Matthew G. Elliott, Andrew L. Kidston, Daniel Trowbridge, Harmanus M. Welch, New Haven, Conn.; Wm. Walter Phelps, George St. John Sheffield, New York. There is no change from last year.

New York, New Haven & Hartford.—At the annual meeting in New Haven, Jan. 12, the old board was re-elected, as follows: Chester W. Chapin, Springfield, Mass.; Henry C. Robinson, C. M. Pond, Hartford, Conn.; E. M. Reed, E. H. Trowbridge, George H. Watrous, New Haven, Conn.; Wm. D. Bishop, Nathaniel Wheeler, Bridgeport, Conn.; Wilson G. Hunt, George N. Miller, Augustus Schell, Wm. H. Vanderbilt, A. R. Van Nest, New York.

New York, Pennsylvania & Ohio.—Mr. Wm. Fuller, General Master Mechanic, will for the present act as Master Car-BUILDER also, in place of Mr. J. H. F. Wiers, who has gone to the Pullman Company.

North Pennsylvania.—At the annual meeting in Philadelphia, Jan. 10, the following officers were chosen: President, Franklin A. Comly; directors, John Jordan, Jr., William C. Ludwig, Edward C. Knight, Alfred Hunt, Thomas Smith, Ario Pardee, James H. Stevenson, Richard J. Dobbins, Charles A. Sparks, Edwin H. Fitler, Thomas P. Stotesbury, Thomas Cochran.

Mount Pleasant & Bradford.—At the annual meeting in Pittsburgh, Jan. 10, the following officers were chosen: Charles Donnelly, President; directors, Messrs. John King, Wm. Keyser, Mendez Cohen, Hugh Sisson, Charles Webb, G. M. Serpell, O. P. Schupe, Wm. Bissell, Wm. Baldwin, G. B. Rathfon, A. R. Banning, H. S. Burgesser; Secretary and Treasurer, Welty McCullough. The road is leased to the Baltimore & Ohio.

Ohio & West Virginia.—A circular dated Jan. 1 announces the following officers: Orland Smith, General Superintendent; Charles D. Norris, Superintendent; T. J. Janney, Auditor; W. M. Greene, Treasurer; W. A. Mills, General Freight Agent; W. H. Harrison, General Ticket Agent. The general officers are the same as those of the Columbus & Hocking Valley road.

Pennsylvania & New York.—At the annual meeting in Philadelphia, Jan. 10, the following were chosen: President, Robert A. Packer; directors, Robert H. Sayre, Charles Hartshorne, Victor E. Piollet, Garrett B. Lindermann, Harry E. Packer, John J. Taylor, Robert Lockhart, John W. Hollenback, William H. Sayre, Elihu P. Wilbur, James I. Blaklee, Howard Elmer; Secretary and Treasurer, Chas. Hartshorne.

Philadelphia & Reading Leased Lines.—In Philadelphia, Jan. 10, officers were chosen as follows by the companies below, which are leased to the Philadelphia & Reading: *Allentown*.—President, G. A. Nicolls; directors, H. P. McKean, J. B. Lippincott, John Ashurst, F. B. Gowen, Henry Lewis and I. V. Williamson; Secretary, John Welch. *East Mahanoy*.—President, G. A. Nicolls; directors, J. B. Lippincott, F. B. Gowen, I. V. Williamson, Thomas Hart, Jr., Beauveau Borie, Hester Clymer, George D. Stitzel, J. C. Stickler; Secretary, Howard Hancock; Treasurer, John Welch. *Chester & Delaware River*.—President, G. A. Nicolls; directors, H. P. McKean, J. B. Lippincott, F. B. Gowen, Henry Lewis and William Ward; Secretary, Howard Hancock; Treasurer, John Welch. *Reading & Columbia*.—President, G. A. Nicolls; Directors, H. P. McKean, J. B. Lippincott, John Ashurst, F. B. Gowen, Henry Lewis, I. V. Williamson, John N. Hutchinson, Frederick Lauer, Thomas Baumgardner, Samuel Small, Francis W. Christ, Philip Arndt; Secretary, Howard Hancock; Treasurer, John Welch. *Chestnut Hill*.—Coffin Colket, Joseph Patterson, William L. Schaeffer, F. B. Gowen, E. H. Well, H. K. Smith, William W. Colket, A. E. Dougherty, W. S. Wilson, John Clayton, Lewis Elkins, Joseph B. Townsend, directors.

Philadelphia, Wilmington & Baltimore.—At the annual meeting in Wilmington, Jan. 10, the following directors were chosen: Enoch Pratt, Samuel M. Shoemaker, Thomas Whitridge, Baltimore; Jacob Tome, Port Deposit, Md.; Christian Feigler, Samuel Harlan, Jr., Charles Warner, Wilmington, Del.; Samuel M. Felton, Thurlow, Pa.; Isaac Hinckley, Wm. Sellers, Philadelphia; Charles P. Bowditch, Edward Hooper, Wm. Minot, Jr., Richard Olney, Nathaniel Thayer, Jr., Boston. The only new director is Edward Hooper, who succeeds R. H. Stevenson. The board re-elected the old officers as follows: President, Isaac Hinckley; Vice-President, Enoch Pratt; Secretary and Treasurer, Alfred Horner; Assistant Secretary and Treasurer, Robert Craven.

Philadelphia, Wilmington & Baltimore Controlled Lines.—In Philadelphia, Jan. 10, officers were chosen as below for these companies, which are controlled by the Philadelphia, Wilmington & Baltimore: *Philadelphia & Baltimore Central*.—President, Henry Wood; directors, Samuel Dickey, David Woelper, John H. Jackson, William Ward, M. B. Hickman. *West Chester & Philadelphia*.—President, Henry Wood; Managers, Isaac Hinckley, David Woelper, Charles Warner, H. F. Kenney, M. B. Hickman.

Pittsburgh & Lake Erie.—At the meeting in Pittsburgh, Jan. 10, the following officers were chosen: President, Dr. Jacob Henrich; Vice-Presidents, James I. Bennett, Dr. David Hostetter; directors, Ralph Bagaley, Wm. M. Lyon, W. W. Watson, John Reeves, James M. Bailey, Herbert Dupuy, James M. Shoomaker, A. E. W. Painter, J. H. Dev-

ereux, John Newell. Dr. Henrici succeeds Mr. Bennett as President, and the Vice-Presidents are new officers, though one of them was last year President and the other a director, as was also Dr. Henrici. Messrs. Bagaley and Dupuy are new directors, succeeding Joshua Rhodes and John F. Dravo. This is the result of a sharp contest for control, which was, however, purely local, and not affecting the standing of the road as an independent line out of Pittsburgh. The Board re-elected the old officers as follows: General Manager, W. C. Quincy; General Freight Agent, E. D. Nettleton; General Solicitor, J. H. McCreery; Secretary and Treasurer, J. G. Robinson; General Passenger Agent and Auditor, A. D. Smith.

Pittsburgh & Western.—At the annual meeting in Philadelphia, Jan. 10, the following were chosen: President, J. W. Jones; directors, Clarence H. Clark, George F. Tyler, Edward A. Rollins, Archer N. Martin, Levi N. Wagner, Foster W. Mitchell, B. K. Jamison, C. C. Pomeroy, Harold M. Sill.

Pittsburgh & Western.—The officers of this company are: President, James Callery; Vice-President, A. M. Marshall; General Manager, J. J. Saint; Secretary and Treasurer, J. B. Stevenson; Superintendent, W. J. Bonner.

Prairie du Sac, Sauk City & Mazonian.—The directors of this new company are: Wm. F. Conger, H. C. Keyser, E. W. Young, Prairie du Sac, Wis.; Conrad Knoni, Paul Lachmand, Christian Obrecht, J. B. Quimby, Sauk City, Wis.

Pullman Palace Car Co.—Mr. L. M. Johnson has been appointed Assistant to the President. Mr. Johnson has been for three years General Manager of the Cairo & St. Louis, and was previously Chief Engineer of the Keokuk & Des Moines road.

St. Louis, Jerseyville & Springfield.—Mr. C. S. Masten, of Rochester, N. Y., has been appointed Chief Engineer.

St. Louis, Vandalia & Terre Haute.—At the annual meeting in Greenville, Ill., Jan. 11, the following directors were chosen: Thomas D. Messier, J. N. McCullough, William T. How, W. R. McKeen, R. L. Dunaway, W. S. Smith, A. G. Henry, Charles H. Seydel, J. S. Peers. The board re-elected Thomas D. Messier, President; W. H. Barnes, Treasurer; and Williamson Plant, Secretary. The road is leased to the Terre Haute & Indianapolis Company.

San Antonio & Mexican Border.—The following officers were recently chosen for this company: President, James W. Barnes; Vice-President, R. Quimby; Secretary, O. C. Pope; Treasurer, H. C. King; Attorney, T. J. Devine. Office in San Antonio, Texas.

Toledo & Ann Arbor.—Mr. Harry W. Ashley has been appointed General Superintendent, succeeding James M. Ashley, Jr., who has been made Attorney of the company.

Valley of Ohio.—Mr. Bela C. Bosworth, of Canton, O., has been appointed Master Mechanic. He has been a locomotive engineer on the road since its opening.

PERSONAL.

—Mr. J. B. Wilder has resigned his position as President of the Louisville, Cincinnati & Lexington Company, for reasons not made public.

—Hon. Garret A. Hobart, formerly Receiver of the New Jersey Midland and the Montclair & Greenwood Lake roads, and now a director of the Midland, of New Jersey, has been chosen President of the New Jersey Senate. Mr. Hobart is now in his second term as Senator; he was several years ago a member of the House and Speaker for one term.

—Mr. Zebina C. Camp, formerly a large railroad contractor, died at his residence in Montpelier, Vt., Jan. 3, aged 75 years. He built a large part of the Vermont Central and the Vermont & Canada roads, had large contracts for the Great Western and also for the construction of docks and harbor works at the Georgian Bay terminus of the Northern, of Canada. For over 20 years past he had lived quietly in Montpelier.

—Mr. John B. Brown, widely known as a capitalist interested in railroads, died at his residence in Portland, Me., Jan. 10, from the effect of a fall on the ice while walking in the street the previous day. Mr. Brown made a considerable fortune in trade and sugar refining, but retired from that business ten years or more ago. He was prominent in the building of the Atlantic & St. Lawrence, the Maine Central, the Portland & Ogdensburg and the Portland and Rochester roads, and was a large stockholder in the Portland Company and the Portland Rolling Mill. For some time he was a director of the Erie.

—Mr. Charles R. Clement, General Baggage Agent of the Pennsylvania Railroad, who died on Jan. 8, was born Dec. 6, 1839. After graduating from Dartmouth College, Mr. Clement spent about three years in the study of law at Woodstock, Vt., but having been offered a lucrative position in the office of the Superintendent of Transportation of the Pennsylvania Railroad at Altoona, he in 1867 accepted the same, and continued in that position until 1870, when he went to Jersey City as Division Superintendent of the Central Transportation Company. He removed to Philadelphia in 1871 to accept the position of advertising agent in connection with the Passenger Department of the Pennsylvania Railroad, and was appointed General Baggage Agent of that company in August, 1872, which position he held at the time of his decease.

TRAFFIC. AND EARNINGS.

Grain Movement.

For the week ending Jan. 1 receipts and shipments of grain of all kinds at the eight reporting Northwestern markets and receipts at the seven Atlantic ports have been, in bushels, for the past eight years:

Year.	Northwestern receipts.	Northwestern shipments.	Atlantic receipts.
1873.	2,697,297	407,730	2,005,703
1874.	2,147,360	790,017	1,494,357
1875.	2,003,225	958,855	1,630,724
1876.	2,452,664	984,795	1,882,838
1877.	1,528,048	1,099,330	3,561,847
1878.	2,548,745	1,149,265	2,560,146
1879.	1,096,747	3,114,803	4,232,089
1880.	2,862,690	1,648,451	2,510,233

Compared with the corresponding week in previous years there is a decrease of one-third from 1879 in Northwestern receipts, but an increase of nearly 60 per cent. in Northwestern shipments. Atlantic receipts were a fifth less than last year, and the smallest for the last week of the year for four years.

Compared with previous weeks of this year, the Northwestern receipts are nearly a fourth less than the week before, and, with one exception (the week ending Jan. 17), are the smallest of any week in 1880. The Northwestern shipments are a trifle less than the week before, but with that exception are the largest for five weeks, and larger than in any of the first six weeks of the year. The Atlantic

receipts are 12 per cent. less than the week before, are the smallest since February, and with the five exceptions (each of the five weeks from Jan. 18 to Feb. 21), were the smallest of the year. This week this year coincided exactly with holiday week; those of other years included one or two days before Christmas or after New Year's Day, the weeks reported always ending with Saturday.

Of the Northwestern receipts Chicago had 55.1 per cent., Milwaukee, 13.3; St. Louis, 12.6; Peoria, 9.1; Detroit, 3.8; Cleveland, 3.8, and Toledo, 2.3 per cent.

Exports from Atlantic ports for four successive weeks have been:

Jan. 5.	Dec. 29.	Dec. 22.	Dec. 15.
Flour, bushels.....	120,499	157,060	138,389
Grain, bushels.....	2,206,164	2,611,377	2,363,848

Receipts are 12 per cent. less than the week before, are the smallest since February, and with the five exceptions (each of the five weeks from Jan. 18 to Feb. 21), were the smallest of the year. This week this year coincided exactly with holiday week; those of other years included one or two days before Christmas or after New Year's Day, the weeks reported always ending with Saturday.

Of the Northwestern receipts Chicago had 55.1 per cent., Milwaukee, 13.3; St. Louis, 12.6; Peoria, 9.1; Detroit, 3.8; Cleveland, 3.8, and Toledo, 2.3 per cent.

Exports from Atlantic ports for four successive weeks have been:

Jan. 5.	Dec. 29.	Dec. 22.	Dec. 15.
Flour, bushels.....	120,499	157,060	138,389
Grain, bushels.....	2,206,164	2,611,377	2,363,848

Receipts are 12 per cent. less than the week before, are the smallest since February, and with the five exceptions (each of the five weeks from Jan. 18 to Feb. 21), were the smallest of the year. This week this year coincided exactly with holiday week; those of other years included one or two days before Christmas or after New Year's Day, the weeks reported always ending with Saturday.

Of the Northwestern receipts Chicago had 55.1 per cent., Milwaukee, 13.3; St. Louis, 12.6; Peoria, 9.1; Detroit, 3.8; Cleveland, 3.8, and Toledo, 2.3 per cent.

Exports from Atlantic ports for four successive weeks have been:

Jan. 5.	Dec. 29.	Dec. 22.	Dec. 15.
Flour, bushels.....	120,499	157,060	138,389
Grain, bushels.....	2,206,164	2,611,377	2,363,848

Receipts are 12 per cent. less than the week before, are the smallest since February, and with the five exceptions (each of the five weeks from Jan. 18 to Feb. 21), were the smallest of the year. This week this year coincided exactly with holiday week; those of other years included one or two days before Christmas or after New Year's Day, the weeks reported always ending with Saturday.

Of the Northwestern receipts Chicago had 55.1 per cent., Milwaukee, 13.3; St. Louis, 12.6; Peoria, 9.1; Detroit, 3.8; Cleveland, 3.8, and Toledo, 2.3 per cent.

Exports from Atlantic ports for four successive weeks have been:

Jan. 5.	Dec. 29.	Dec. 22.	Dec. 15.
Flour, bushels.....	120,499	157,060	138,389
Grain, bushels.....	2,206,164	2,611,377	2,363,848

Receipts are 12 per cent. less than the week before, are the smallest since February, and with the five exceptions (each of the five weeks from Jan. 18 to Feb. 21), were the smallest of the year. This week this year coincided exactly with holiday week; those of other years included one or two days before Christmas or after New Year's Day, the weeks reported always ending with Saturday.

Of the Northwestern receipts Chicago had 55.1 per cent., Milwaukee, 13.3; St. Louis, 12.6; Peoria, 9.1; Detroit, 3.8; Cleveland, 3.8, and Toledo, 2.3 per cent.

Exports from Atlantic ports for four successive weeks have been:

Jan. 5.	Dec. 29.	Dec. 22.	Dec. 15.
Flour, bushels.....	120,499	157,060	138,389
Grain, bushels.....	2,206,164	2,611,377	2,363,848

Receipts are 12 per cent. less than the week before, are the smallest since February, and with the five exceptions (each of the five weeks from Jan. 18 to Feb. 21), were the smallest of the year. This week this year coincided exactly with holiday week; those of other years included one or two days before Christmas or after New Year's Day, the weeks reported always ending with Saturday.

Of the Northwestern receipts Chicago had 55.1 per cent., Milwaukee, 13.3; St. Louis, 12.6; Peoria, 9.1; Detroit, 3.8; Cleveland, 3.8, and Toledo, 2.3 per cent.

Exports from Atlantic ports for four successive weeks have been:

Jan. 5.	Dec. 29.	Dec. 22.	Dec. 15.
Flour, bushels.....	120,499	157,060	138,389
Grain, bushels.....	2,206,164	2,611,377	2,363,848

Receipts are 12 per cent. less than the week before, are the smallest since February, and with the five exceptions (each of the five weeks from Jan. 18 to Feb. 21), were the smallest of the year. This week this year coincided exactly with holiday week; those of other years included one or two days before Christmas or after New Year's Day, the weeks reported always ending with Saturday.

Of the Northwestern receipts Chicago had 55.1 per cent., Milwaukee, 13.3; St. Louis, 12.6; Peoria, 9.1; Detroit, 3.8; Cleveland, 3.8, and Toledo, 2.3 per cent.

Exports from Atlantic ports for four successive weeks have been:

Jan. 5.	Dec. 29.	Dec. 22.	Dec. 15.
Flour, bushels.....	120,499	157,060	138,389
Grain, bushels.....	2,206,164	2,611,377	2,363,848

Receipts are 12 per cent. less than the week before, are the smallest since February, and with the five exceptions (each of the five weeks from Jan. 18 to Feb. 21), were the smallest of the year. This week this year coincided exactly with holiday week; those of other years included one or two days before Christmas or after New Year's Day, the weeks reported always ending with Saturday.

Of the Northwestern receipts Chicago had 55.1 per cent., Milwaukee, 13.3; St. Louis, 12.6; Peoria, 9.1; Detroit, 3.8; Cleveland, 3.8, and Toledo, 2.3 per cent.

Exports from Atlantic ports for four successive weeks have been:

Jan. 5.	Dec. 29.	Dec. 22.	Dec. 15.
Flour, bushels.....	120,499	157,060	138,389
Grain, bushels.....	2,206,164	2,611,377	2,363,848

Receipts are 12 per cent. less than the week before, are the smallest since February, and with the five exceptions (each of the five weeks from Jan. 18 to Feb. 21), were the smallest of the year. This week this year coincided exactly with holiday week; those of other years included one or two days before Christmas or after New Year's Day, the weeks reported always ending with Saturday.

Of the Northwestern receipts Chicago had 55.1 per cent., Milwaukee, 13.3; St. Louis, 12.6; Peoria, 9.1; Detroit, 3.8; Cleveland, 3.8, and Toledo, 2.3 per cent.

Exports from Atlantic ports for four successive weeks have been:

Jan. 5.	Dec. 29.	Dec. 22.	Dec. 15.
Flour, bushels.....	120,499	157,060	138,389
Grain, bushels.....	2,206,164	2,611,377	2,363,848

Receipts are 12 per cent. less than the week before, are the smallest since February, and with the five exceptions (each of the five weeks from Jan. 18 to Feb. 21), were the smallest of the year. This week this year coincided exactly with holiday week; those of other years included one or two days before Christmas or after New Year's Day, the weeks reported always ending with Saturday.

Of the Northwestern receipts Chicago had 55.1 per cent., Milwaukee, 13.3; St. Louis, 12.6; Peoria, 9.1; Detroit, 3.8; Cleveland, 3.8, and Toledo, 2.3 per cent.

Exports from Atlantic ports for four successive weeks have been:

Jan. 5.	Dec. 29.	Dec. 22.	Dec. 15.
Flour, bushels.....	120,499	157,060	138,389
Grain, bushels.....			

grant and second-class business for 1880 on the lines east of St. Louis and Chicago, shall be furnished to Mr. H. W. Gwinner, their Commissioner, to enable him to compile the statistics of the business.

In the afternoon of the same day, the general passenger agents had a conference with the general managers, and submitted the above resolutions, which were adopted. In place of the rejected resolution to discontinue all commissions to outside agents, one was adopted that there should be a uniform agreed rate for such commissions, and that they should be paid only through Commissioner Gwinner. The statistics are to be gathered to enable the companies to agree upon terms for pooling their business.

The Southwestern Passenger War.

Last week the Chicago & Alton made another cut on passenger rates from Kansas City to Chicago. The example was followed by the Chicago, Rock Island & Pacific and the Hannibal & St. Joseph, those roads putting down to \$4 the fare from Kansas City to Chicago, which they had before kept at \$10, the regular rate.

Chicago Shipments Eastward.

For the week ending Jan. 1, the shipments of freight from Chicago by the pooled lines were:

	Flour—bbls...	Grain—tons...	Provisions— tons...	Total tons...	P. c. by each.
Michigan Central.....	20,120	5,747	1,834	9,563	23 0
Lake Shore.....	31,374	7,451	2,982	13,550	32 4
Fort Wayne.....	18,267	2,701	3,351	7,968	19 1
Pan-Handle.....	7,929	278	3,053	4,103	6 8
Baltimore & Ohio.....	2,158	1,279	1,122	2,615	6 2
Grand Trunk.....	8,020	2,532	637	3,969	9 5
Total.....	87,768	20,078	12,981	41,867	100 0

The Lake Shore is above and all the others below their allotted percentages.

The shipments for the previous week were 51,396 tons.

The shipments are very large for holiday week.

The shipments by the several roads under the Chicago pool were as follows during the week ending Jan. 8:

	Flour, bbls.	Grain, tons of 2,000 lbs.	Prov's, tons of 2,000 lbs.	Total tons.	P. c. of total.
Michigan Central.....	13,849	7,306	2,953	11,643	23 6
Lake Shore.....	30,711	9,386	2,923	15,380	31 2
Fort Wayne.....	31,365	2,733	3,414	9,281	18 8
Pan-Handle.....	10,569	701	3,808	5,565	11 2
Baltimore & Ohio.....	1,322	1,725	2,237	4,094	8 3
Grand Trunk.....	6,426	2,293	470	3,404	6 9
Total.....	94,242	24,144	15,805	49,367	100 0

The total shipments for four successive weeks have been, in tons:

	Dec. 18.	Dec. 25.	Jan. 1.	Jan. 8.
	45,067	51,396	41,867	49,367

These are very large shipments.

RAILROAD LAW.

Damages for Injury to Passenger.

In the Ohio & Mississippi Co. against Allen, appeal, the Indiana Supreme Court has just held as follows:

1. A railway company is liable for injuries to a person traveling on a "shipper's pass," although such pass stipulates that the company shall not be liable for injuries done to the person using it.

2. The evidence of a person injured, as to the amount of damages sustained by him is clearly incompetent. He may properly describe his injuries, but it is not competent for him to estimate the amount of damages which he has sustained; that is a question for the jury to determine.

Freight Books as Evidence of Delivery.

In Schaeffer against the Georgia Railroad, the Georgia Supreme Court holds (the first section relating only to technical points of practice):

2. In a suit against a railroad for loss of goods shipped over its line, it was competent for the defendant to prove by the agents of a connecting road delivery in good order to it; and although the witnesses may never have seen the goods, they may testify from the books of their company, proved to have been made in the usual order of business and to be accurate.

3. When a writing is shown to be lost or beyond the jurisdiction of the Court, secondary evidence of its contents is admissible.

Judgment affirmed.

THE SCRAP HEAP.

Locomotive Building.

The Baldwin Locomotive Works in Philadelphia recently shipped several consolidation freight engines to the Missouri Pacific road.

The Pennsylvania Railroad shops at Altoona have received orders to build 10 new locomotives for passenger service as soon as possible.

The Grant Locomotive Works in Paterson, N. J., have an order to build two new locomotives of the Fontaine friction-driver pattern. They are to have 17 by 24-inch cylinders, and to be somewhat heavier than the first one built.

Prescott, Scott & Co., in San Francisco, have completed a locomotive for the Antioch & Grangeville single-rail road.

The Canada Engine & Machine Works, in Kingston, Ont., are building several locomotives for the Northern Railway of Canada, and one for the Kingston & Pembroke road.

Miller & Lloyd, of the Duquesne Forge, Pittsburgh, lately forged six sets of locomotive frames for consolidation engines.

The Danforth Locomotive Works, in Paterson, N. J., are full of work, with orders for several months ahead.

It is said that the Atchison, Topeka & Santa Fe has let contracts for 75 locomotives, distributed among the following named locomotive works: Brooks, 10; Pittsburgh, 25; Manchester, 13; Hinckley, 17; Baldwin, 10.

Car Notes.
The Atchison, Topeka & Santa Fe Company has let contracts for 1,900 freight cars as follows: Wells, French & Co., Chicago, 800; St. Charles Manufacturing Co., St. Charles, Mo., 500; Missouri Car & Foundry Co., St. Louis, 350; Litchfield Car Co., Litchfield, Ill., 250. All are to have the Thielson truck.

The shops of the Little Rock & Ft. Smith road at Argenta, Ark., have lately completed two passenger cars, each 52 ft. long and mounted on six-wheel trucks. They were designed

by Master Mechanic Thomas Rennell and the wood-work is entirely of Arkansas woods.

The Central Vermont shops at St. Albans, Vt., are running full time, with a full force busy both on new work and repairs.

Wilson's flexible blinds have been put in 20 passenger coaches lately built by the Harlan & Hollingsworth Co., at Wilmington, Del., on 10 by the Jackson & Sharp Co., on 20 by the Gilbert & Bush Car Co., and on five by Bowers, Dure & Co.

Iron and Manufacturing Notes.

The rolling mill at Atlanta, Ga., which was sold last August to satisfy a mortgage, is now run by the purchasers, who have organized as the Georgia Iron Works, E. W. Holland being President, Grant Wilkins Superintendent and Manager, and Ed. Holland Secretary. The mill is now running to its full capacity.

The firm of Sellers, Fowler & Co., of Chicago, has been dissolved, Mr. H. W. Fowler having retired and sold out his interest to Mr. Morris Sellers, who will continue the business under the firm name of Morris Sellers & Co.

Duquesne Forge, of Miller & Lloyd, in Pittsburgh, is making the shaft and cranks for a side-wheel steamer, now building at Baltimore, and some heavy forging for the new steel works at Chicago.

The iron works and rolling mill at Birmingham, Conn., have passed into the possession of the Peck, Stow & Wilcox Co., of Southington, in the same state.

The Baltimore & Ohio Company has started up the girder mill in its rolling mill at Cumberland, Md., which has been idle some time.

The Detroit Emery Wheel Co. is very busy with all the work it can do.

The present owners of the Oliphant Furnace in Fayette County, Pa., have organized the Fayette Coke & Furnace Co., with A. W. Bliss, President; George C. Marshall, Secretary; A. H. Childs, Treasurer.

Soho Iron, in Pittsburgh, in December, 1880, made 3,862 tons of pig iron, the largest monthly production ever recorded for this furnace.

The large plate mill of Samuel Seifert near Gibraltar, Pa., has most of the machinery in, and will probably be ready to start up in a week or two.

The Railway Speed Recorder Company, at the annual meeting held at Kent, O., Jan. 3, elected W. W. Wythe, A. L. Dunbar, Charles Miller, E. A. Parsons and J. B. Miller directors; A. L. Dunbar, President; E. A. Parsons, Secretary and Treasurer; J. B. Miller, Superintendent; W. D. Drake, General Agent.

The Rail Market.

The *Iron Age* of Jan. 6, gives the following review of the rail market for 1880:

"The demand throughout the whole year has been very urgent, and orders for many thousand tons have of necessity been sent abroad. The total importations of rails, including iron, since the boom set in, is about 250,000 tons. The output of steel rails in the United States is estimated by Mr. Swank at 775,000 gross tons. A large addition is being made to the productive capacity; eight converters are in process of erection in Pennsylvania and two in Illinois, which will increase the output of ingots and blooms about 500,000 tons. It must be remembered, however, that Bessemer steel is being used for many purposes other than for rails. Plates are being rolled from it very extensively, and it is coming into use for other purposes, causing a large demand for ingots and blooms. It is anticipated that upward of 900,000 gross tons of rails can be turned out if necessary, and from present appearances the demand is likely to be equal to the fullest capacity. Prices opened in January at \$72.50, advanced to \$80 before the close of the month, and during February were held at \$85, with several sales at \$82.50 to \$85. During March prices gradually declined, and sales could not be made unless at concessions from asking rates. This was still more marked during April, and at the close a reduction of \$10 to \$15 per ton from the highest point had to be conceded. The decline continued during the first half of May, until \$80 was reached, since which time the market has been very steady and changes so slight as to call for no special remark. During September and October orders for nearly half a million tons were taken at prices varying from \$57 to \$60; but it is usual to make concessions for winter work, so that the decline was a nominal one, and was no indication of weakness. One or two transactions were said to have been made at \$55 to \$56, but they were quite exceptional. Sales of foreign rails have been made from time to time, recently several lots for the South and Southwest. Prices seem to be strengthening, and toward spring will, in all probability, be higher; but our manufacturers will meet the price of foreign rails, whatever that may be. Some of the iron rail mills are taking orders for steel rails to be rolled from foreign blooms. A sale of this character was made last week—30-lb. rails at \$63, from mill—in Pittsburgh. From the fact that upward of 25,000 tons of foreign blooms have been sold in this market recently, it may be inferred that a larger business will be done this year than has been done before. There are some peculiar risks, however. The duty of 45 per cent. charged is based not on actual cost, but on value at the time the duties are paid, which, in the event of rapid advance, is a serious item. Manufacturers find it more convenient to have the purchaser of rails furnish the blooms from which they are to be rolled, but under present conditions it is scarcely probable that the business will assume very large proportions. Iron rails have been in constant demand; opening in January at \$80, advancing to \$87.50 before the close of the month, and continued steady at about that figure until the first week in April. During April there was a steady decline, each week showing prices from \$2 to \$2.50 per ton lower than during the preceding week. May opened with \$85 asked, declined to \$80 before the close of the second week, and to \$78 before the closing of the month. During June prices settled down to \$75 as a minimum, since which time the market has been fairly active and very steady, with only slight variations in prices, and these usually in the way of improvement. Prospects are favorable for a heavy demand, but our manufacturers are at a serious disadvantage, raw material having advanced without any equivalent for the product. Prices to-day are nominally \$46 and \$47, but it is difficult to sell at the one figure and buy at the other. Foreign rails can be delivered at \$44 at tide, and, except in special locations, our manufacturers are not in a position to meet competition, especially as old rails are scarce, and, from present appearances, likely to be higher. However, there is every prospect that the demand will be active, and it is to be hoped that prices will improve. There are a few inquiries in the market already, and a sale of 800 tons English rails (56s.) has just been closed at \$46, in store here."

Heating Cars in Sweden.

The *English Mechanic* says in a recent number:

"The heating of railway carriages on the government lines in Sweden with steam began in 1871-72, the Haag system being adopted. This system, though having many good points, did not fully realize expectations. About three years

ago M. Lilliehök, a Swedish engineer, devised a system, which has proved to be much better adapted to the conditions of the country, and is now used on all the government lines and on some private ones. Its special feature (as compared with the Haag system) is, that the fresh air of the coupé, instead of being heated in the coupé itself, is heated in a holder previous to entering. By this arrangement a good ventilation is secured, and the heated air is much more agreeable. A wooden tube or case is fixed under the carriage (from which it is easily detachable). This incloses the steam-pipe, which is furnished with a large number of discs, to increase the heat-surface. The carriage has a double floor, with open interval. In the bottom of the wooden tube are holes to admit the cold air, and after heating the air enters through valves (controlled by the passengers) under the seats, and covered by brass netting. The caoutchouc tubes, connecting the pipes of adjoining carriages, are bent upward, so that condensation water does not accumulate in them. This water is let off at the ends of the iron pipes about every 1½ hours. The interval under the carriage always being filled with warm air, passengers have no trouble from cold feet. The cost of maintenance of the system, which is described in *Dingler's Journal*, is said to be trifling."

OLD AND NEW ROADS.

Atlanta & Alabama.—A meeting of the incorporators of this company was held in Atlanta, Jan. 8, for organization. The charter was accepted and a committee appointed to prepare the details of the organization. The road is to run from Atlanta to the coal fields of Alabama.

Atlantic & North Carolina.—The Governor of North Carolina, in his annual message to the Legislature, says of this road, in which the state is chief owner: "The Atlantic & North Carolina Railroad Company is in a fairly prosperous condition. For the last two years it has met promptly all its obligations, and paid promptly the accruing interest on its bonded and judgment debt. The bonded debt is \$195,500, at 8 per cent. interest, and the judgment debt is \$37,474 at 6 per cent. No part of this indebtedness was contracted in the last two years. During this time, I am informed, the company has paid cash for all its purchases, and has spent considerable sums in repairing roadway and rolling stock. Several offers have been made within the last year for the lease of this property, and on Nov. 23 a meeting of the stockholders was held to consider these propositions. As it was but a short time prior to your assembling, I took the responsibility of preventing any change in the status of this property till you could be heard. The private stockholders held a meeting, after the adjournment of the company meeting, and passed resolutions expressive of their opinions and wishes as to the proposed lease. I send you herewith a copy of the proceedings of their meeting. From this it will be seen that they are clearly in favor of a lease, and a majority of them to the Wilmington & Weldon Railroad Company. I have stated on more than one occasion, both publicly and privately, that this road was built chiefly for the benefit of the people east of Goldsboro, and that I desired to see it managed and operated in the way best calculated to develop and build up that section of the state, and that I had no policy or wishes in antagonism to the wish of the private stockholders along its line. It is now for you to give such directions concerning this property as you may think the interest of the state and the Atlantic section demand, and your action shall control. In the event you take no action, I shall no further interfere in the matter, one way or the other, but shall leave that question, as I do all others, to be settled by the company, without interference on my part."

Baltimore & Delta.—At the annual meeting last week it was stated that the road is nearly all graded; that the unpaid stock subscriptions will be sufficient to complete the grading and masonry, and pay for station grounds and the right of way. It is estimated that it will cost \$450,000 to complete and equip the road after the grading and masonry are finished. To accomplish this the directors will issue bonds of the road amounting to \$600,000, bearing 6 per cent. interest, and it is believed that there will be no difficulty in disposing of these bonds at satisfactory rates.

Baltimore, Pittsburgh & Chicago.—A dispatch from Wooster, O., Jan. 12, says: "The stockholders of the Ohio Division of the Baltimore, Pittsburgh & Chicago Railroad met here to-day and accepted a proposition of the representatives of the Pittsburgh Division to transfer to the latter the control, with the right of way, etc., in consideration of the latter agreeing to construct a road through Wooster, equip and have it in running order by July 4, 1882. There was only one dissenting vote. The operation of the New York Central, it is rumored, has been secured."

Boston & Lowell.—At the annual meeting in Boston, last week, a resolution was passed authorizing the issue of new stock to the amount of \$620,000.

President Abbott stated that the new stock would be apportioned among the stockholders according to their holding at par, and that the money would not be called for immediately, but only as needed in the future. It was stated at the meeting that the trouble now existing between the Vermont Central and the Northern roads was not in any way attributable to the Boston & Lowell, or to any action that it had taken. The company had been and is now on the best of terms with all of its connecting companies; and its business is being carried on in a perfectly satisfactory manner. In response to an inquiry of one of the stockholders, Mr. Abbott stated that though the legality of the recent lease of the Nashua & Lowell road had been brought into question, he had no doubt but that it would stand and that the original plan of the corporation would be finally carried out.

Burlington, Cedar Rapids & Northern.—This company has begun work on the rebuilding of the old Chicago, Clinton & Western line from Elmira to Clinton, Ia., which it owns, and which was all graded and had some track laid on it several years ago. There is no very expensive work to be done, the heaviest being across the Wapsie, including the bridge over that river.

Burlington, Monmouth & Illinois River.—This road is now graded from Peoria, Ill., through Farmington westward 45 miles; about 18 miles of piling and bridging are done, and 35,000 ties are ready.

California Railroad Commission.—A suit has been begun in the United States Circuit Court in San Francisco, by the Pacific Coast Steamship Company, to enjoin the California Railroad Commission from prescribing rates on freight carried by the company, and from making other regulations relating to its affairs. The suit is intended as a test case to determine the constitutionality of the laws under which the Commission acts.

Canadian Pacific.—A telegram from Ottawa, Ont.,

Jan. 6, says: "It is announced that a rival syndicate has been formed for the construction of the Canadian Pacific, and it is also stated that it is willing to undertake the work for a bonus of \$20,000,000 and 20,000,000 acres of land. This is more favorable to the country than the contract now before Parliament by \$5,000,000 and 5,000,000 acres of land. The new syndicate is also willing to pay duties on all materials imported for the construction, and pay municipal taxes in the provinces which may be formed in the Northwest, and to pay 5 to 10 per cent. on the gross earnings to the Dominion government. It is composed of capitalists of first rank in Canada, who have no interest in any United States railway."

The debate on the government grant is still going on in Parliament at Ottawa. It meets with strong opposition.

Another dispatch from Toronto, Ont., Jan. 12, says: "The new syndicate is in session here discussing a proposition which it will submit to the House of Commons. The draft of an agreement was made out yesterday and printed to-day. The meeting will make such alterations as are thought necessary, and will send the amended agreement to Ottawa by mail to-night. Clauses 15 and 16 of the agreement now before the House, the former providing that no branch lines are to be built south or southeast, and the latter providing for the exemption of railway rolling stock, etc., from taxation, have been struck out altogether by the new company; also the clause relating to duty upon material. It reduces the cost to \$22,000,000 in money and 20,000,000 acres of land, the reduction being upon the prairie section. The cost of construction of the other sections is left as in the agreement under discussion at present. The syndicate claim to guarantee a preliminary payment of more than 10 per cent."

Canon City & Western.—This company has been organized in Colorado to build a railroad from the coal fields of Tremont County to Canon City, and thence to Fairplay and Leadville, with branches to other mining towns.

Cape Fear & Yadkin Valley.—The message of the Governor of North Carolina says of this road, in which the state has an interest: "The work on this road has progressed more rapidly than was expected. The grading has been completed to Greensboro. The issue and sale of the first-mortgage bonds of the company, authorized by the act of 1879, are going on, and it is believed enough money will be realized from the sale to iron and equip the road to Greensboro. Only \$30,000 of \$50,000 appropriated was paid out by the Treasurer in adjusting the indebtedness of the company. The only aid the state is now giving this important work is the maintenance of the convicts, for which she is to receive the first-mortgage bonds of the company. Upon those already received the interest has been promptly paid. * * * This road, I believe, will soon be running to Greensboro. It will then be only necessary to fill the gap of 30 miles between Fayetteville and Lumberton to open up another and shorter line of railway from Wilmington to Greensboro. With that or some such connection made and the road pushed as rapidly as possible into the northwestern counties, the benefits derived from a road running diagonally across the state will be felt and appreciated by a large belt of the state from Wilmington to the mountains."

Carson & Colorado.—Work is progressing steadily on this road; 104 miles of grading are done and tracklaying in progress. The road starts from the Mound House, Nev., a station on the Virginia & Truckee road, and will run to Candelaria, 150 miles distant. At the foot of Walker Lake the company has built a wagon road to Aurora and Bodie, about 40 miles. The road will reach some valuable mining districts.

Catskill Mountains.—Surveys have been completed for this road from Catskill, N. Y., west to Palenville, a distance of 15½ miles. The line mainly follows the course of Catskill Creek, and is said to be an easy one.

A company known as the Catskill Mountain Extension Company has been organized to build a branch of the road from Cairo to East Durham, about 10 miles.

Central Pacific.—The following statement has been published for the six months ending Dec. 31, the month of December partly estimated:

Earnings of road	\$11,905,730
Earnings of river steamers	12,500
Interest on sinking funds and investments, and miscellaneous	428,000
Land sales	220,000
Total	\$12,566,230
Working and general expenses	\$6,760,000
Land Department expenses	40,000
Interest on funded debt	1,700,000
Discount and interest	150,000
New construction and equipment	500,000
Sinking funds	530,000
United States sinking funds	450,000
Redemption of land bonds	220,000
Estimated surplus over all charges	\$2,216,230

From this the board has declared a 3 per cent. dividend, which will take \$1,778,265, leaving \$437,965 on hand. The gross earnings for the six months show an increase of \$2,607,976, or 28 per cent., over the same period in 1879.

Chatteroi.—The track on this road has reached Louisa, Ky., on the Big Sandy River, 31 miles south of its northern terminus on the Ohio River at Ashland. Eight miles more are to be laid to reach the Peach Orchard coal mines. The course of the road is nearly due south up the Big Sandy, and it is possible that several miles out of Ashland it may use the track of the Elizabeth, Lexington & Big Sandy.

Chesapeake & Ohio Canal.—In the United States Circuit Court, in Baltimore, in the Stewart suit, an order has been entered refusing the application for a receiver. The Court, however, retains the bill, keeping the suit alive, and directs the managers of the canal to file quarterly statement of the receipts and an itemized account of all expenditures, with a statement showing the number of employees, their duties and the salaries paid them.

Cincinnati Belt.—This company has filed articles of incorporation to build a railroad partly in and partly around the city of Cincinnati, the object being to provide better connections between the railroads entering the city and to furnish additional terminal facilities for business; also to provide means for rapid transit between various parts of the city and its suburbs.

Cincinnati & Eastern.—Application has been made to the Court to discharge the Receiver of this road and return it to the company. It is claimed that the floating debt is now funded, the road in good condition and earning enough to pay all charges.

Cincinnati & Northern.—This road, formerly the Miami Valley, has track laid from the Marietta & Cincinnati Crossing at Norwood, O., to Lebanon, 24½ miles, and regular trains will be put on this section about Feb. 1. From Norwood to Cincinnati there is some heavy work, and the road

will hardly be done before April. From Lebanon north the grade is completed to Waynesville, 41 miles, and early this season will be extended to Dayton to connect with the Toledo, Delphos & Burlington road.

Denver & Pacific.—This company has filed articles of incorporation in Utah, according to which the company "is organized to construct, equip, own and operate by steam power railroad from a point at or near the city of Ogden, in Weber County, Utah, to point on the boundary between Colorado and the territory of Utah, easterly, from a point at or near the junction of White and Green rivers, in Utah Territory, the general route of said road being southerly along the valley of Great Salt Lake to some point most practicable for passing through the Wasatch range of mountains, easterly; thence in an easterly direction by the most practicable route through said range to the waters running into the Green River, to the point before named, at or near the mouth of White River; said road being intended to connect with a railroad from Denver City, in Colorado, to said point in said Colorado and Utah, wherever said point of junction may be found to be most feasible and eligible. The entire length of said route and railroad contemplated being estimated at about 250 miles." The capital stock is fixed at \$5,000,000.

East Tennessee, Virginia & Georgia.—On the Selma Division of this road, formerly the Selma, Rome & Dalton, the Ashby Branch, which is to extend 12 miles into the Cahaba coal field in Alabama, is partly graded. It is owned by parties interested in the coal mines, but will be worked as a branch of this road.

Evansville, Dayton & Eastern.—This company has been organized to build a railroad from Evansville, Ind., to Dayton, O., with several branches, making 240 miles of road in all. The capital stock is to be \$6,500,000.

Georgia.—Mr. Carlton Hillyer, Auditor, presents the following statement of the earnings of this road for December and the nine months of its fiscal year from April 1 to Dec. 31:

	December	1880.	1879.	1880.	1879.	Nine months
Gross earnings	\$151,413.80	\$150,174.02	\$79,363.28	\$773,593.08		
Expenses	81,403.82	81,865.55	708,464.04	528,900.81		

Net earnings \$70,000.98 \$68,308.47 \$270,899.24 \$244,692.27

Per cent. of exps. 53.77 54.58 72.34 68.38

For December there was an increase of \$1,239.78, or 0.8 per cent., in gross and of \$1,701.51, or 2.5 per cent., in net earnings. For the nine months the report shows a gain of \$205,770.20, or 20.6 per cent., in gross earnings, and of \$26,266.97, or 10.7 per cent., in net earnings.

Green Bay & Minnesota.—Testimony has been taken in the suit of Receiver Case against D. M. Kelley and others, former officers of this company, and it will soon come up for argument. The suit is to recover a large amount of land along the line of the road to which title was taken by defendants, but which, the Receiver claims, really belongs to the company. Mr. Kelley has put in the suit a counter claim of some \$300,000 against the company.

Hannibal & St. Joseph.—It is stated that this company is preparing a mortgage for \$8,000,000, under which new 6 per cent. bonds will be issued to retire all the present debt of the company, much of which bears 8 per cent. interest. This amount will be sufficient for the purpose, and it is also intended to pay off the land grant bonds outstanding—now only \$322,000—on payment of which all the land assets and only the income from the land grant will be released from the trustee's possession and revert to the company.

Indiana, Bloomington & Western.—An organization as the Inter-state Improvement and Construction Company, has been formed to build the proposed extension of this road from Indianapolis to Springfield, O. This company offers \$1,500,000 of its stock to Indiana, Bloomington & Western stockholders, who are to have the option of taking six shares for ten of their stock in the railroad. Books of subscription will be open at the office in New York from Feb. 1 to Feb. 5.

Indianapolis, Coal & Southern.—This company has filed articles of incorporation in Indiana to build a railroad from Indianapolis southwest to Evansville, about 150 miles. The capital stock is to be \$1,500,000.

Indianapolis & Springfield.—At the annual meeting in Indianapolis, recently, it was resolved to extend the projected road so as to include a branch from Bainbridge, Ind., to Brazil, about 20 miles.

Kansas Railway.—This company has been organized to build a railroad from Kansas City, Mo., west to the west line of Kansas, with branches to Emporia and Greeley. The articles cover about 700 miles of road.

Lehigh & Hudson River.—This company has been organized to build a road from Belvidere, N. J., eastward to Andover on the Sussex Railroad. The distance will be 23 miles and some heavy work will be required. The object of the road is to complete a line from the Pennsylvania and Lehigh Valley roads at Easton to the Hudson. The plan at present is to use the Belvidere Division, Pennsylvania Railroad, from Easton to Belvidere; then the new road to Andover; thence by the Sussex railroad to McAfee, and by the Warwick Valley road to Greycourt, where connection can be made with the Erie for Jersey City and Newburgh.

Marietta & Cincinnati.—Receiver King reports in November \$318,876 receipts and \$329,808 disbursements, an excess of disbursements of \$10,932 for the month.

Minnesota Northern.—This company, which has been organized in the Northern Pacific interest, has filed amended articles defining the route as follows: "From a point on the Northern Pacific Railroad, in range 36 in the county of Otter Tail, in the state of Minnesota, and extending thence southwesterly, by the way of East Battle Lake and Fergus Falls, to the western boundary line of said state of Minnesota and thence to the Black Hills, in the territory of Dakota; and from Fergus Falls northerly up the Pelican Valley to the northern boundary line of said county of Otter Tail; and from a point of junction with the main line of said railroad above described in East Battle Lake township in said county in a southerly direction through the counties of Douglas and Pope; and northerly from said point of junction by way of Otter Tail Lake, Perham and White Earth to Red Lake Falls in said state of Minnesota.

"The principal place of transacting the business of said organization shall be at the village of Fergus Falls, in said county of Otter Tail."

Mobile & Ohio.—Work on the Cairo Extension of this road, from Columbus, Ky., to East Cairo, has been delayed by bad weather, but is now well advanced. About two-thirds of the grading and all the heavy bridge-work are completed. The company expects to have the road ready by April.

Narrow Gauge Project.—A dispatch from Cincinnati, Jan. 7, says: "Gen. Corse, President of the Toledo, Delphos & Burlington Railroad; Hon. Logan H. Roots, and Colonel B. Bahr, of Arkansas; Colonel J. W. Paramore, President of the Texas & St. Louis Railroad, and a number of capitalists of this city, have had a conference regarding the consolidation of all the narrow gauge roads and interests in Ohio, Indiana, Illinois, Missouri, Arkansas and Texas, with a view to the construction of a continuous line from Toledo to the Rio Grande. The proposition was received with great favor."

Nashville, Chattanooga & St. Louis.—During December this company added to its rolling stock 4 coaches, 110 box cars, 50 coal cars, and will add 50 more coal cars during the present month. When all these are placed on the road it will own 350 coal cars. The Tennessee Coal & Railroad Company own 100 cars, which will make 450 cars employed alone in the hauling of coal.

The United States Circuit Court in Nashville, Tenn., has refused the application of the minority stockholders for a receiver. The Court said substantially, that many questions had been argued, which the Court did not think it necessary to pass upon in this application; that the Court would not express any opinion as to the right of the Louisville & Nashville to purchase stock in the Nashville, Chattanooga & St. Louis; as this question was one referable to the charters of the two companies and the laws of the states of Kentucky and Tennessee, into which the Court do not think it necessary at present to examine. For the present it was sufficient to say that the allegation of the bill to the effect that the Louisville & Nashville was dominating and controlling the road in its own interest and to the injury of the minority stockholders had not been sustained; that, on the contrary, the affidavits filed satisfied the Court that the road was being run and managed by the President and directors in a safe, prudent, economical and independent manner, and for the best interest of all the stockholders; it was not unlawful for a person or corporation to purchase and hold the majority of the stock in a corporation with a view to controlling it, provided it was controlled and managed in the interest of the stockholders and according to law; that to warrant the Court in the appointment of a receiver, and taking this valuable property from the hands of its officers and directors, the Court must be satisfied that it was being managed in such way as to injure one part of the stockholders for the benefit of the others; that, in this respect the record left the Court in no doubt that the property was being managed for the best interest of all the stockholders, and with fairness and good faith.

In reference to an injunction against leasing the road to the Louisville & Nashville the Court said that the officers of the road disclaimed any knowledge of any such proposition, or of having heard of it until the bill was filed, and that no such thing had ever been contemplated, and, therefore, the injunction would be denied; but, if it should be proposed hereafter to lease it, the Court would hear this branch of the case at any time upon the application of either party. Every allegation of the bill of the complainants had been specifically denied and overthrown. A decree was entered in accordance with the opinion.

New York Central & Hudson River.—It is probable that an agreement has at last been reached in the long controversy between this company and the city of Rochester. A contract has been drawn up and will probably be signed next week, which provides for the elevation of the tracks through the city, and also for settlement of the other points in dispute.

New York & New England.—This company has placed \$1,000,000 of its 6 per cent. general mortgage bonds at 100%. They were taken by Kidder, Peabody & Co. The last issue of these bonds was taken at 97½.

New York, New Haven & Hartford.—At the annual meeting in New Haven, Jan. 12, the stockholders accepted an amendment to the charter authorizing the company to own and use steamboats and barges for the transfer of trains.

Stockholder Goodwin, who has usually made things lively at this company's meetings, was not present, but another stockholder called out some discussion by a resolution to stop the running of all trains on Sunday, including the milk train. It was not passed.

Ohio Central.—At a meeting held last week the stockholders voted to approve the consolidation with the company of the Ohio Central Coal Company, thus bringing the railroad and coal properties under the same management; they already have the same ownership.

Oregonian.—The contractors who have been building the road of this company on Dec. 28 transferred to the company the line from Ray's Landing on the Willamette River to Brownsville, 72 miles. This makes 81 miles of track laid this year on the company's road. The company already owned the 35 miles of the former Willamette Valley road, so that this new line makes 116 miles of road. The connection between Ray's Landing and Portland is now made by steamboat, but work is in progress on the grading between the two places, 30 miles.

Pennsylvania.—This company has just contracted for the longest wooden pier in America, to be built at Harsimus Cove, the freight terminus in Jersey City, for the shipment and delivery of ocean and railroad freight, and especially grain. The original plan was for a pier 500 feet long, which has been increased to the extraordinary length of 1,380 feet, with a width of 75 feet, making the largest pier in the country. The contract requires that it shall be built in 100 working days, ending in the middle of March next. Its extent may be further judged of from the fact that 5,300 piles are used in the construction, gathered from New York state and floated down the Hudson river, or brought from the East. The cost of this great wooden pier will be \$150,000. Eventually it will be covered with sheds. This pier will enlarge the accommodations for steamers, so that a number of them can load or discharge simultaneously, the whole operation of discharging and filling again not to exceed 24 hours.

Philadelphia & Reading.—The opinion of Judge McKennan, of the United States Circuit Court, on the application for an order for the postponement of the annual meeting last week was as follows:

"In the present condition of my mind, I must refuse this application. The custody of the property of this railroad devolves on the Receivers appointed by the Court; they are the custodians of it for the benefit of the creditors, as the object of the whole proceeding is the preservation of the property for the benefit of the creditors. I do not think the Court has any other function to exercise than that which will assist in carrying out the object to which I have referred. Nor do I think that the Court should stretch its power beyond that, however desirable for the Court to do so. The Receivers must take care of the property—do what is absolutely necessary to preserve it for the benefit of the creditors, and I am unable to see that the power which the Court is asked to exercise is pertinent to any such purpose. And, therefore,

without stating any more in detail the reasons which have led me to that conclusion, it is sufficient for me to say that such is the impression I have now, and I must refuse the application.

"If the directors want any advice from me (and what I say must not be regarded as a judicial utterance) in regard to the annual meeting of the stockholders, which it is proposed to hold on next Monday, I would say that, inasmuch as it is conceded that the action of the directors is essential to the legality of the meeting, they ought not to do anything that might make a serious complication hereafter. The best I will say is, the question is a very doubtful one in my mind, and my own impression is that it would not be safe to hold the meeting or do anything important under this call. I think they ought not to ratify the call nor hold the meeting."

Acting on this, the board of managers withdrew the notice for the annual meeting, and it was not held on Jan. 10, the regular day. By consent of counsel the matter was left to the board, and no attempt was made by the anti-Gowen party to hold a meeting, as had been proposed. The board met on Jan. 12, and voted to postpone the meeting indefinitely. Counsel for the McCalmonts, however, made application to the Court of Common Pleas, in Philadelphia, for a *mandamus* to compel the board to call a meeting, and the Court has granted an order to show cause why such a writ should not be granted.

The latest statement is, that the anti-Gowen party control about 213,000 shares. The number credited to President Gowen is about 71,000 shares.

In relation to the deferred bond scheme, a petition has been presented to the United States Circuit Court, representing that the prospectus put out by the company for the issue is illegal, as the terms of the order have not been complied with. The petition is very long, rehearsing the history of the matter, and sums up its prayer as follows:

"First. That an order be at once made revoking the decree made by the Court, and that in the meantime Mr. F. B. Gowen and all other persons connected with the said railroad company, as well as the Receivers, in these actions be ordered and enjoined to abstain from any further action in the negotiation or consummation of the said scheme for the issuing of the thirty-four millions of deferred bonds.

"Second. That if the Court shall be of opinion that the scheme should, either in whole or in part, be carried out, then the officers of the company and the Receivers shall be directed to refrain from the issue of any such instruments until the form of the same shall be settled by this Court upon notice to your petitioners and others interested; and also, until the deposit with the Receivers has been made of the \$2,058,000 provided to be deposited as a guarantee that the said scheme will be carried into effect and consummated."

Dispatches from London, Jan. 12, state that Mr. Gowen had ordered the \$2,058,000 deposit made in London to be transferred to Philadelphia at once, to meet the legal objections raised. The same dispatch states that the London subscriptions for the deferred bonds amounted to \$50,000,000, or one-half more than the amount offered.

Pittsburgh & Western.—Argument was in progress last week in the suit as to the right of this company to build the track of its extension through to Allegheny City, Pa., across the grounds of the Western Penitentiary, owned by the state of Pennsylvania. The question at issue is the right of the company to take land owned by the state without express legislative permission.

Prairie du Sac, Sauk City & Mazomanie.—This company has been organized in Wisconsin to build a railroad from Mazomanie, on the Prairie du Chien Division of the Chicago, Milwaukee & St. Paul, northeast by Prairie du Sac and Sauk City to Portage, about 30 miles. The line is through the Wisconsin Valley, and presents no great difficulties in construction.

St. Joseph & Western.—The *Commercial and Financial Chronicle* says: "Default was again made Jan. 1 on the St. Joseph & Pacific bonds of this company. Great indignation is expressed by the stock and bondholders that they can get no information whatever in regard to the earnings of the road, or the financial condition of the company. Even the terms of the lease to the Union Pacific have never been made known. Repeated applications to the officers of the company and the lessees fail to get any satisfactory answers."

St. Louis Central.—This company has been organized to build a railroad from Murphysboro, Ill., to East St. Louis, about 90 miles. It would be parallel to the Cairo & St. Louis.

St. Louis, Iron Mountain & Southern.—At a recent meeting of the board it was decided to recommend an increase of the capital stock to \$35,000,000 and of the bonds to \$32,000,000, and a special meeting of the stockholders was called to vote on the question. The new issues are to be used for building branch lines and improving the road. By the last report (Jan. 1, 1880) the company had \$21,458,961 stock and \$30,068,658 bonds outstanding.

St. Louis & San Francisco.—A notice was issued to stockholders under date of Dec. 29, 1880, of a special meeting to be held at the company's office in St. Louis, on Tuesday, March 1, 1881, at 9 a. m.:

"For the purpose of considering and acting upon a proposed issue by said company of its consolidated mortgage bonds to an amount not exceeding \$30,000,000, bearing interest at not exceeding 6 per cent. per annum, and running not less than 30 years, as its board of directors may hereafter determine; said bonds to be secured by a mortgage covering all the lines of railroad now owned by said company and the franchises and property appertaining thereto, and also all the interest of said company, now owned or hereafter to be acquired, in any or all of the lines of railroad now leased to or operated by it, or which may be hereafter leased to or constructed or operated by it, and the franchises and property pertaining thereto, or so much and such parts thereof as its directors may determine; and which said bonds are to be used, so far as necessary, to retire or provide for all the bonded indebtedness for which said company is now liable at such times and on such terms as the board may direct, and after reserving sufficient for such purposes, the residue shall be used for the construction, acquisition or equipment, or for aiding in the construction, acquisition or equipment of additional lines of railroad connecting with lines now owned or operated by it, and to the improvement and equipment of any lines of road now or hereafter to be operated by it in such manner and to such extent as its board of directors may determine."

St. Paul, Minneapolis & Manitoba.—The crossing of the Grand Forks, Fargo & Barnesville Branch over the Northern Pacific track, near Moorhead, has at last been put in, all opposition having been withdrawn. Work is now progressing on the unfinished section of the branch.

Securities on the New York Stock Exchange.—The following securities have been placed on the lists at the New York Stock Exchange:

"Burlington, Cedar Rapids & Northern, \$825,000 first

mortgage 6 per cent. gold bonds of the Cedar Rapids, Iowa Falls & Northwestern Railway Company.

Utah Southern.—\$1,500,000 general mortgage bonds, bearing 7 per cent. interest, Nos. 1 to 1,500.

Wabash, St. Louis & Pacific.—\$4,500,000 Toledo, Peoria & Western first-mortgage 7 per cent. bonds, and \$1,600,000 Havana Division 6 per cent. bonds.

Lake Erie & Western.—\$327,000 first-mortgage 6 per cent. bonds, and \$600,000 income bonds of the Sandusky Division.

International & Great Northern.—\$1,175,000 new stock.

Louisville & Nashville.—\$5,284,000 general mortgage 6 per cent. gold bonds, Nos. 14,717 to 20,000.

Dubuque & Dakota.—\$80,000 first-mortgage 6 per cent. bonds, Nos. 551 to 630.

Telegraph Consolidation.—The *New York Graphic*, of Jan. 12, says: "It can now be authoritatively announced that a consolidation of the rival telegraph companies—the Western Union, the Atlantic & Pacific and the American Union—has at last been effected. The final arrangements were concluded this morning. The matter has been under consideration for several days, but the completion of the negotiations was not effected until to-day."

It is understood that the combination was effected on the basis of \$80,000,000 capital for the new company, of which the Western Union is to have \$58,000,000, the American Union \$15,000,000, and the Atlantic & Pacific \$7,000,000. The present capital of the Western Union is about \$41,000,000, of the American Union \$15,000,000, and of the Atlantic & Pacific \$14,000,000. Thus it will be seen that the Western Union gets a scrip dividend of 40 per cent., the American Union goes in at par and the Atlantic & Pacific is put in at 50. It is undeniable that this movement has been engineered throughout by Jay Gould, who to-day holds a vastly preponderating control of the entire telegraph system of the country. It is a movement in which he has checkmated his opponents completely, and it is estimated that his profits run up into the millions.

The present movement in telegraph stocks was begun in the latter part of November by Mr. Vanderbilt, who ran the stock up from about par to 104½ to enable him to unload, which he did all the way down to 90, as he saw the preparations the rival line was making for a severe and protracted competition. From 90 the stock was carried down some 13 points by Gould's short sales. The speculative movement lay dormant for a few days, but assumed activity by the sale of one block of 20,000 shares at 78½, seller 60 days, and another of 10,000 shares on a similar option at 78. The street was mystified as to the purport of the transactions, but speculators generally were induced to put out heavy lines of shorts. From this point the stock began to advance, and immense transactions were the order of the day. There is little doubt but that Gould and Vanderbilt have been acting in concert in the buying movement, although it is believed that Gould is by far the largest buyer, as he appears to have dictated the settlement of to-day. A week ago the stock was selling in the neighborhood of 80, and at this writing the stock is quoted at 106, with blocks of 10,000 shares and thereabouts selling at the market."

Union Pacific.—In the Dakin suit to recover 103,690 shares of stock in the former Kansas Pacific Company, the United States Circuit Court has sustained a demurral to the complaint, but granted plaintiff leave to file an amended bill.

Vicksburg & Meridian.—A plan of reorganization has been prepared by the trustees and representatives of the bond and stockholders. The plan proposes a new first mortgage for \$1,000,000, a second for \$1,100,000, and a third for \$1,918,881. Subscribers under the plan will receive as follows:

For "red endorsed bonds," the par of the principal and one-half the interest thereon adjusted as above to April 1, 1881, in new 40 year first-mortgage 6 per cent. bonds, and balance of interest in the new third-mortgage bonds.

For "blue endorsed bonds," the par of the principal and one-half the interest adjusted as above to May 1, 1881, in new 40 year second-mortgage bonds, with interest 3 per cent. for two years, 4 per cent. for two years, 5 per cent. for one year, and 6 per cent. to maturity. Balance of interest in the new third-mortgage bond.

For "black endorsed bonds," 75 per cent. of the principal in new second-mortgage 40 year bonds, with interest at 3 per cent. for two years, 4 per cent. for two years, 5 per cent. for one year, 6 per cent. at maturity, and 25 per cent. of the principal, and all interest adjusted to May 1, 1881, in the new third-mortgage bonds.

For "unindorsed bonds," for principal the new third-mortgage bonds. Interest adjusted to April 1, 1881, in preferred stock.

For "honorable loan bonds," principal and interest to Jan. 1, 1881, in new third-mortgage bonds.

For "preferred stock scrip," new preferred stock at par.

For "common stock," 50 per cent. thereof in new stock. On payment of 3 per cent., full amount deposited in new stock and a third-mortgage bond to the amount of assessment paid.

Under this plan the company will have the earnings of the year 1880 and part of 1881; the proceeds of about \$245,000 of the new first-mortgage bonds; of about \$22,000 of the new second-mortgage bonds, and of assessments on the stock for the purpose of putting the road in good condition.

Holders of bonds will be required to pay at the time of deposit of their bonds with the said Farmers' Loan and Trust Company one half of 1 per cent. of their face value, for defraining in part the expense of the reorganization.

In the event that at least 90 per cent. of the bonds and stock are not deposited with the Trust Company on or before March 1, 1881, the trustees of the existing mortgage will take possession of the railroad and institute proceedings for its sale, and the bonds and stock deposited in pursuance of this plan can unite in the purchase of said railroad.

Western Maryland.—A suit is now in progress at Chambersburg, Pa., in which the Cumberland Valley Company seeks to enjoin this company's Baltimore & Cumberland Valley line from crossing its tracks at grade. A large amount of testimony has been taken on both sides.

Western North Carolina.—In his message to the Legislature Governor Jarvis, of North Carolina, says: "The purchasers of the state's interest in this road have thus far complied with their contract with the state. They have paid promptly the hire of the convicts, and the interest on the first-mortgage bonds of the company, as they contracted to do. They have paid off the floating debt of the company and have laid down about two miles of new iron. Their \$80,000 deposit is still in the Citizens' National Bank of this city (Raleigh), as collateral security for the faithful performance of their contract."

"Owing to hindrances and delays in effecting their organization, the work upon the road has not progressed as rapidly as was expected; but there are now 500 convicts at work, and I am informed by the owners, as soon as the open weather of spring comes, the construction will be pushed rapidly forward on both lines."

Weston & Webster.—This company has filed a certificate of incorporation in West Virginia to build a railroad from Weston, in Lewis County, by the valleys of the West Fork, Little Kanawha and Holly rivers southward into Webster County, about 45 miles. The company also intends to mine coal and other minerals and to manufacture iron. The corporators are Mark Dougan, W. G. Goodrich, H. P. Daly, William Schneber, T. J. Diven, J. H. Muhlke and C. H. Goodrich, all of Chicago. They are also corporators of another company known as the West Virginia Central.

West Virginia Central.—This company has filed articles of incorporation in West Virginia to build a railroad from Grafton, on the Baltimore & Ohio, southwest by Philippi, Weston and the Elk River Valley to Charleston, a distance of about 120 miles. The company also intends to engage in the business of mining coal, iron ore and other minerals, and of manufacturing iron. The incorporators are J. W. Heavener, of Buckhannon, W. Va.; W. G. Goodrich, Henry P. Daly, J. H. Muhlke, T. J. Diven, Wm. Schneber, Mark Dougan, all of Chicago.

White River.—This company has filed articles of incorporation in Indiana to build a spur from the Indianapolis, Decatur & Springfield track into Indianapolis, to reach some large factories.

Xenia & Southeastern.—It is proposed to build a narrow-gauge road from Xenia, O., south by east to Hillsboro, about 40 miles, crossing nearly all the lines running into Cincinnati from the East. The object of such a line is not very clearly apparent.

Zanesville & Eastern.—It is proposed to build a railroad from Zanesville, O., eastward about 20 miles to the Eastern Ohio road at Point Pleasant. The object is to reach some mineral property on the line.

ANNUAL REPORTS.

The following is an index to the reports of companies which have been reviewed in previous numbers of this volume of the *Railroad Gazette*:

	Page.
Boston, Hoosac Tun. & West...	12
Fitchburg...	12
N. Y., N. H. & Hartford...	11

New Haven & Northampton.

This company owns a line from New Haven, Conn., to Williamsburg, Mass., 83.88 miles, with branch from Farmington, Conn., to New Hartford, 14 miles, and it leases the Holyoke & Westfield road, from Westfield, Mass., to Holyoke, 10.32 miles, making 108.20 miles worked. The report is for the year ending Sept. 30.

The equipment consists of 21 engines; 18 passenger and baggage cars; 128 box, 302 flat and 7 caboose cars; 1 tool, 1 derrick and 41 gravel cars. One locomotive and 20 box cars were added during the year.

The general account, condensed, is as follows:

Stock.....	\$2,460,000.00
Bonds.....	2,680,000.00
Bills payable.....	214,000.00
Accounts and balances.....	57,385.71
Income and expenditure account.....	214,323.24
Total.....	\$5,634,708.95

This company owns a line from New Haven, Conn., to Williamsburg, Mass., 83.88 miles, with branch from Farmington, Conn., to New Hartford, 14 miles, and it leases the Holyoke & Westfield road, from Westfield, Mass., to Holyoke, 10.32 miles, making 108.20 miles worked. The report is for the year ending Sept. 30.

The equipment consists of 21 engines; 18 passenger and baggage cars; 128 box, 302 flat and 7 caboose cars; 1 tool, 1 derrick and 41 gravel cars. One locomotive and 20 box cars were added during the year.

New Haven & Northampton.

Cash from last report.....	\$20,217.34
Earnings for the year.....	604,506.35
Interest and dividends received.....	3,800.00
Sale of bonds (\$794,000) and premium.....	708,900.00
Increase bills payable.....	109,700.00
October coupons payable.....	15,880.00
Accounts due last report, sale of land.....	27,616.89
Town of Hamden.....	14,000.00
Total.....	\$1,684,020.58

There was an increase in both funded and floating debt during the year, as shown in the condensed income account following:

Cash from last report.....	\$20,217.34
Earnings for the year.....	604,506.35
Interest and dividends received.....	3,800.00
Sale of bonds (\$794,000) and premium.....	708,900.00
Increase bills payable.....	109,700.00
October coupons payable.....	15,880.00
Accounts due last report, sale of land.....	27,616.89
Town of Hamden.....	14,000.00
Total.....	\$1,684,020.58

Balance, cash at close of year.....

Working expenses.....	\$203,116.06
Interest, rentals, etc.....	208,418.41
Construction and real estate.....	573,019.34
Sinking fund.....	15,000.00
Bonds paid.....	429.00
Balances and accounts due.....	30,218.73
Increase in materials on hand.....	28,011.96
Total.....	\$1,676,784.50

Balance, cash at close of year.....

Interest, rentals, etc.....	208,418.41

<tbl_r cells="2" ix="

done; they have iron bridges and steel rails, and there are no grade-crossings on the lines. They will give the road a good connection with the Hoosac Tunnel Line, with a branch to the large manufacturing town of Turner's Falls, and are expected to increase its income largely.

Wabash, St. Louis & Pacific.

At a meeting of the board of directors in New York, Jan. 11, the following statement was submitted for the year 1880, December partly estimated. The earnings, etc., were as follows:

Gross earnings	\$12,362,865
Expenses (61.82 per cent.)	7,642,227
Net earnings	\$4,720,638
Add rents, etc.	12,500
Total	\$4,733,138
Interest and rentals	\$3,197,248
Taxes	261,600
Floating interest, pool balances, etc.	130,200
Use of foreign cars	137,007
	3,726,055
Surplus for the year	\$1,007,083

From this it was decided to pay a dividend of 1½ per cent. on the preferred stock, which will take \$300,000, leaving \$707,083. The board hopes to be able to keep up the quarterly dividend.

In presenting the report President Humphreys said: "The result of the year's operations I regard as quite satisfactory, in view of the difficulties we have had to contend with.

"The destruction of part of the St. Charles Bridge in November, 1879; the repairs and loss of traffic incidental to this cause, I estimate at not less than \$500,000.

"2. The Omaha Division, owing to the difficulties of working a new road in the open and excessively rainy winter and spring of last year, afforded us little benefit from that line for the first four months.

"The new road to Chicago was completed in March, but owing to the opposition and delay in our getting into Chicago, that division has afforded us as yet little benefit. The interest and cost of maintenance of these divisions have therefore borne heavily on our income, without corresponding benefit. Both of these lines will hereafter become the most productive sources of our revenue.

"3. The income for the first four months of the past year was burdened with many contracts at very low rates and many rebate charges growing out of the railroad war of 1879.

"4. Our expenditures in maintaining and operating our road include large amounts that in future we shall in a large degree be relieved from. Our main lines are now laid with steel, with the exception of a few miles, from Toledo and Chicago to St. Louis, Kansas City, and Omaha. We have upward of 1,500 miles laid with steel.

"5. These items, I estimate, together exceed \$1,250,000, which in the coming year we can count on as additional to our net income, barring any extraordinary drawbacks.

"6. I have further to add the difficulties and delays incidental to the joining together of so many roads, and I can with all confidence say that we have as yet realized only a small portion of the benefits anticipated from the consolidation of the seven roads now comprised in our company. It will be seen that our operating expenses in the past year were about 61 per cent.; this, I believe, we can reduce materially.

"In view of all which, I recommend the commencement of dividends on our preferred stock at the rate of 6 per cent. per annum, payable quarterly. Our stockholders set apart \$6,000,000 of our general mortgage bonds to provide permanent improvements and equipments, on the understanding that the net earnings should be divided; but while I believe we shall in the future earn more than sufficient to pay 7 per cent. on our preferred stock, as provided in the consolidation agreement, I think it more prudent and more for the interest of the stockholders to limit our dividends to 6 per cent. on the preferred stock, until we shall have accumulated a sufficient surplus to warrant an increase to 7 per cent. and a certainty of its continuance."

Long Island.

This company owns and leases a net work of roads covering the whole of Long Island except the Coney Island district at its western end. The road is in the hands of a Receiver, and the following figures are from his report to the New York State Engineer for the year ending Sept. 30, 1880:

The official statement of mileage is as follows:

Main Line, Long Island City to Greenport	Miles. 94,784
Sag Harbor Branch, Manor to Sag Harbor	35,202
Northport Branch, Hicksville to Northport	15,072
Locust Valley Branch, Mineola to Locust Valley	10,461
Hempstead Branch, Mineola to Hempstead	2,500
Creedmoor Branch, Hinsdale to Creedmoor	2,016
Smithtown & Pt. Jefferson, Northport to Pt. Jefferson	19,015
Stewart R. H., Hinsdale to Bethpage	14,530
Garden City to Hempstead	1,806
New York & Rockaway, Junction to Far Rockaway	8,912
Brooklyn & Jamaica, Jamaica to Flatbush Ave.	9,678
Newtown & Flushing, Winfield to Flushing	3,967
F. N. S. Central, Hunter's Point to Flushing, Main st.	7,851
N. Y. & Flushing, Hunter's Point to Southside Junction	2,728
Central Extension, Bethpage to Babylon	8,156
Whitestone Branch, Junction to Whitestone	4,000
Great Neck Branch, Junction to Great Neck	6,740
Woodside & Flushing, Woodside to Flushing	3,903
Brooklyn & Montauk, Bushwick to Patchogue	51,578
Hunter's Pt. & So. Side, Junction to Fresh Pond	1,515
Far Rockaway Branch, Valley Stream to Neptune House	9,410
N. Y. & Long Beach, Pearsalls to Long Beach	6,004
Total	320,008

The New York & Long Beach road was built during the year and worked about three months. Other changes have been made since last year by the abandonment of some short duplicate lines.

The equipment consists of 78 engines; 157 first-class passenger, 23 second-class passenger, 29 combination and 18 baggage, mail and express cars; 386 freight cars; 10 service cars and 3 snow-plows.

The stock and debt at the close of the last two years were as follows:

	1880.	1879.
Stock paid in	\$3,260,700.00	\$3,260,600.00
Funded debt	2,713,672.50	2,479,712.00
Unfunded debt and equipment trust	1,123,793.73	725,386.00

Total. \$7,908,166.23 \$6,465,686.00

Both funded and unfunded debt increased during the year, the former \$233,960.50, the latter \$398,407.73, a total increase of \$632,368.23 in the debt.

The traffic reported is as follows:

	1879-80.	1878-79.	Inc. or Dec.	P. c.
Passenger train miles	1,500,881	1,414,752	I. 176,129	12.4
Freight train miles	292,092	297,722	D. 5,695	2.2
Total	1,882,908	1,712,474	I. 170,434	9.9
Passengers carried	6,224,202	5,043,848	I. 1,184,444	23.5
Tons freight carried	320,837	286,071	I. 34,766	12.2

A very large part of the passengers are carried only short distances.

The earnings for the year were as follows:

	1879-80.	1878-79.	Inc. or Dec.	P. c.
Passengers	\$1,169,403.65	\$1,032,689.46	I. \$136,714.19	13.2
Freight	531,366.98	463,977.03	I. 67,389.05	14.5
Mail, express, etc.	111,078.04	121,282.54	D. 10,204.50	8.4
Total	\$1,811,848.07	\$1,617,949.03	I. \$193,898.74	11.9
Expenses	1,365,855.72	1,279,590.80	I. 86,204.92	6.7
Net earnings	\$445,992.05	\$338,350.13	I. \$107,633.82	31.8
Gross earn. per mile	5,751.00	4,068.90	I. 783.00	15.7
Net earn. per mile	1,415.87	1,039.22	I. 376.65	36.2
Per cent. of exps.	75.37	79.10	D. 3.82

The increase in earnings is considerable. The system is necessarily an expensive one to work, on account of the heavy train service needed to accommodate the business, and the duplication of short lines resulting from the former competition between the lines.

The charges against net earnings were as follows:

Net earnings	\$445,992.05
Rentals of leased lines	165,399.17
Paid on account of funded debt	16,500.00
" floating debt accrued prior to appointment of Receiver	4,306.93
Assessment, Long Island City	54,313.18

Excess of payments \$322,707.11

The Receiver also reports expenditures for new construction of \$68,010.31; new equipment, \$86,359.91; other improvements, \$1,944.61, making a total on construction account of \$156,314.83, and increasing the expenditures to the sum of \$179,021.94 in excess of the receipts for the year.

Northeastern (South Carolina).

This company owns a line from Charleston, S. C., north to Florence, 102 miles. Its report is for the year ending Sept. 30.

The earnings for the year were as follows:

	1879-80.	1878-79.	Increase.	P. c.
Passage	\$100,309	\$86,007	\$14,302	16.6
Freight	284,746	245,068	39,678	16.2
Mails	10,839	15,192	4,647	30.9
Total	\$404,804	\$346,267	\$58,627	16.9
Expenses	210,235	210,903	8,332	4.0

Net earnings \$185,659 \$135,364 \$50,295 37.1

Gross earn. per mile. 3,970 3,395 575 16.9

Net earn. per mile. 1,820 1,327 493 37.1

Per cent. of expenses. 54.20 60.90

The increase both in gross and net earnings was very large, extending to every item of revenue.

The financial condition of the company on Sept. 30, 1880, was as follows:

Net proceeds of transportation for 1879-80.	\$185,659
Interest on bonds, and other debt.	\$94,238
Taxes	11,982
Balance	106,220
Extraordinary expenses.	27,548
Balance carried to credit of profit and loss	\$51,891
Balance at credit of profit and loss from 1879.	117,446
Total at credit of profit and loss Sept. 30, 1880.	\$139,337

The financial condition of the company on Sept. 30, 1880, was as follows:

Net proceeds of transportation for 1879-80.

Interest on bonds, and other debt.

Taxes

Balance

Extraordinary expenses.

Balance carried to credit of profit and loss

Balance at credit of profit and loss from 1879.

Total at credit of profit and loss Sept. 30, 1880.

The President remarks in his report that this gratifying increase of \$58,627 in the gross receipts is mainly attributable to the general prosperity of the country, and the healthier condition of trade. "During the past year we have moved 91,436 bales of cotton, against 62,153 bales the preceding year—the excess being 29,283 bales. Of these but 16,207 were furnished along the line of our own road; the remainder, 75,229 bales, having reached us from points beyond Florence. * * *

"Our up through freights have exceeded those of the last year by \$16,571, and our way freights those of the previous year by \$7,628. * * * In our passenger service, a like improvement is noticeable—the receipts of this year having been \$100,309, as against \$86,007, the larger proportion of this increase being in our way travel."

Boston & Lowell.

This company owns a line from Boston to Lowell, 26.75 miles, all double track; a line from Salem by Lowell to Lawrence, 29.75 miles, and five short branches 19.25 miles in all, making 75.75 miles owned. It leases the Middlesex Central road, 10.75 miles, making 86.50 miles worked. Its report is for the year ending Sept. 30, 1880.

The general account is as follows, condensed:

Stock (84,200 per mile).	\$3,250,000.00
Bonds (84,517 per mile).	3,296,400.00
Notes payable	321,000.00
Unpaid coupons and balances, October coupons	85,081.68
Profit and loss, balance	580,789.29
Total	\$8,533,270.97
Road and property (\$91,922 per mile)	\$6,963,084.39
Insurance fund	7,915.14
Sinking fund	30,565.58
Og. & Lake Cham. sinking fund	7,334.31
Boston & Lowell and Nashua & Lowell joint account	54,667.76
Materials	184,330.58
Bills and accounts receivable	212,215.68
Cash	73,157.53

The bonded debt was diminished \$200,000 and bills payable increased \$130,000 during the year.

REPORTS OF NEW YORK RAILROADS TO THE STATE ENGINEER AND SURVEYOR FOR THE YEARS ENDING SEPT. 30, 1880, AND SEPT. 30, 1879.

YEAR.	NAME OF ROAD.	NUMBER OF CARS.										TRAIN MILES.							
		1st class pass.	2d class pass.	Freight.	Baggage, mail and express.	Capital stock.	Funded debt.	Unfrunded debt.	Passenger.	Freight.	Service.								
1880.	1. Long Island.	320	390.4	78	157	52	18	386	\$4,000,000	\$2,713,672	\$1,123,794	\$7,294,528	1,590,881	292,027	51,149				
1879.	Do. do.	325.6	385.1	78	158	53	19	385	3,300,000	1,881,750	1,157,861	6,271,300	1,414,752	297,722					
1880.	2. Dunkirk, Allegheny Valley & Pittsburgh.	90.0	14	6	4	2	88	1,300,000	3,200,000	260,704	4,816,039	126,981	184,826						
1879.	Do. do.	99.6	102.5	12	6	2	88	1,300,000	3,200,000	211,929	4,815,379	152,140	276,640						
1880.	3. Boston, Hoosac Tunnel & Western.	47	8	6	4	2	980	10,000,000	Not 'ny.	1,540,499	1,863,425	259,546	1,273,311						
1879.	Do. do.	33	38	9	4	2	670	10,000,000	Not any.	932,470	1,382,558	30,980	8,000						
1880.	4. New York Central & Hudson River.	1,013	2,520.8	630	345	63	162	17,103	69,428,300	41,473,033	5,319,440	105,007,054	5,086,311	11,567,707	5,568,753				
1879.	Do. do.	1,013	2,511.4	602	364	95	167	16,486	69,428,300	39,801,133	685,171	100,773,417	4,842,148	12,019,361	5,079,248				
1880.	5. Lake Shore & Michigan Southern.	1,176.8	2,044.8	495	99	71	83	11,613	54,000,000	35,915,000	845,600	79,978,000	2,412,275	7,578,047					
1879.	Do. do.	1,176.8	2,044.8	495	99	71	83	11,613	54,000,000	35,915,000	None.	79,978,000	2,412,275	7,578,047					
1880.	6. Troy & Boston.	46	61.5	20	15	11	7	451	2,000,000	2,291,500	328,931	2,911,274	185,640	228,773					
1879.	Do. do.	46	61.5	18	15	9	7	451	2,000,000	2,291,500	328,931	2,911,274	185,640	228,773					
1880.	7. Staten Island.	13	13.3	4	10	0	0	None.	210,000	300,000	1,685	480,000	75,565	None.	None.				
1879.	Do. do.	13	13.3	4	9	7	0	None.	210,000	300,000	1,685	480,000	75,565	None.	None.				
1880.	8. Lake Champlain & Moriah.	7.1	11.9	8	None.	3	None.	206	200,000	3,000	None.	480,000	72,988	None.	None.				
1879.	Do. do.	7.7	11.9	8	None.	3	None.	138	200,000	3,000	None.	480,000	72,988	None.	None.				
1880.	9. Ulster & Delaware.	74	70	7	5	5	2	130	1,250,000	1,538,600	114,515	1,088,676	112,860	56,429					
1879.	Do. do.	74	70	7	5	3	2	131	1,250,000	1,532,600	75,229	1,073,359	86,006	43,092					
1880.	10. New York, Ontario & Western	249.6	344.6	70	32	8	20	1,270	65,000,000	80,550	50,163,807	108,582	97,260	107,287					

YEAR.	NAME OF ROAD.	Number of passengers miles.	Tons carried	Ton-miles.	GROSS EARNINGS.						WORKING EXPENSES.						Interest.	Dividends.	
					Passenger	Freight	Other	Total	Operating	Maintenance of equipment	Maintenance of road	Total	Passenger	Freight	Other	Total			
1880.	1.	6,228,202	58,030,827	320,837	10,400,747	1,169,404	531,367	111,078	1,811,849	322,570	188,750	854,518	1,365,856	345,903	228,121	165,399			
1879.	5.043,848	65,570,024	286,071	8,306,059	1,032,689	463,978	121,283	1,617,950	331,335	294,020	744,235	1,279,591	338,359	205,174	183,305				
1880.	2.	124,753	2,472,530	195,538	11,821,472	63,685	118,368	70,849	261,947	151,075	28,297	117,792	279,164	Deficiency.					
1879.	Do.	114,860	2,247,755	254,164	17,043,536	57,802	140,581	75,751	283,134	30,706	137,419	103,118	303,243	Deficiency.					
1880.	3.	106,168	1,664,112	196,780	7,088,297	40,221	81,761	62,503	184,574	17,725	24,814	105,727	148,263	36,308	None.	None.			
1879.	Do.	30,316	209,037	7,947	71,523	4,521	3,737	4,036	13,197	22	13,392	13,413	Deficiency.						
1880.	4.	8,270,857	330,802,223	10,533,038	2,525,130,145	6,011,160	22,199,966	4,364,780	33,175,913	3,134,480	3,611,583	11,103,583	17,849,894	15,326,019	2,822,879	1,022,279	7,141,512		
1879.	Do.	8,130,543	290,053,233	9,615,753	2,295,827	387,593,102	18,270,250	4,173,231	28,306,584	2,845,740	2,703,716	10,123,673	12,272,911	2,749,761	1,929,363	7,139,528			
1880.	5.	8,123,929	173,238,243	8,157,907	1,810,597,646	3,667,090	13,094,231	805,167	18,400,488	2,210,870	15,180,671	6,338,524	10,008,303	8,398,185	2,458,692	274,060	4,010,670		
1879.	Do.	2,727,443	135,470,923	7,061,312	1,614,428,575	3,051,160	10,535,823	850,390	14,437,384	2,151,603	1,268,128	5,218,146	8,637,876	5,790,507	2,490,112	256,029	2,720,657		
1880.	6.	276,170	6,191,024	757,504	28,252,911	159,087	300,654	20,420	570,161	75,992	33,176	201,372	310,540	269,621	188,368	27,400			
1879.	Do.	278,257	6,112,538	812,137	30,501,683	104,040	408,972	20,878	593,890	60,136	43,529	201,711	305,377	288,519	100,830	27,400	137		
1880.	7.	390,151	3,121,208	None.	None.	70,167	6,021	20,878	291,050	16,036	14,028	7,634	28,850	+50,512	71,387	20,965	None.	42,000	
1879.	Do.	356,128	2,849,024	None.	None.	71,063	6,874	186,581	204,518	11,754	6,586	*25,000	179,172	85,346	21,247	None.	42,000		
1880.	8.	575	4,408	481,220	3,592,696	270	156,802	536	161,700	19,976	24,017	42,197	80,190	75,549	210	30,000			
1879.	Do.	191	1,464	196,981	1,436,880	71	87,420	239	87,731	9,800	15,990	18,543	44,352	43,379	4,719		20,000		
1880.	9.	110,783	2,216,639	108,389	2,105,272	65,817	123,341	15,513	206,671	79,540	22,625	73,841	178,009	30,604	18,026				
1879.	Do.	84,694	1,850,000	93,581	1,085,685	53,042	110,040	13,401	178,283	74,313	23,141	62,155	150,606	80,673	18,807				
1880.	10.	273,778	0,346,607	255,410	13,974,253	151,292	377,926	53,904	583,212	85,114	292,429	505,704	17,508						

* Ferry, \$135,772.67. + Ferry, \$169,756.

acquisition of the Buffalo, Chautauqua Lake & Pittsburg road enabled us to control more completely than ever before. It is estimated that over 300,000 people visited the Chautauqua Lake during last summer. From the many improvements in progress and in contemplation along this delightful summer resort, there can be no doubt that a largely increased revenue will inure to your company during 1881 from this source.

The following statement shows the changes in capital accounts during the year :

Common stock, 27,500 shares issued to stockholders of B. C. L. and P. \$1,375,000

Common stock, 811 shares authorized by articles of association in 1876, not heretofore entered. 40,550

Total. \$1,415,550

Preferred stock, 2,500 shares sold at par. \$125,000

" 7,736 shares